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Waterville, Me., 1889.

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IN
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IN
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BY

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FROM MONTHLY NOTES IN THE "AMERICAN NATURALIST."

WATERVILLE, ME.:
1889.

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MINERALOGY AND PETROGRAPHY.[1]

EXTRACTED FROM AMERICAN NATURALIST FOR JANUARY, 1888.

PETROGRAPHICAL NEWS. — The volcanic bombs from the Lake Laach district are divided by Hubbard[2] into four classes—old crystalline and schistose bombs, sanidinite bombs, trachyte bombs, and basalt bombs. The last three varieties are difficult to separate from each other, but are easily distinguishable from the first class. After discussing very briefly the various theories proposed to account for these bodies, the author proceeds to investigate those in which *nosean* occurs. He examines two hundred and sixty thin sections of nosean-bearing bombs, and reaches the following conclusions: (1.) The nosean is in greater part a druse mineral. (2.) The inclusion so characteristic of this mineral consists of magnetite either fresh or slightly altered. (3.) The little red octahedrae mineral so frequently accompanying the titanite of the Lake Laach bombs is closely related to the pyrrhite of San Miguel, and has probably been derived by the alteration of titanite. Several other points of interest in relation to the minerals occurring in these bombs are noted. The most important results reached, however, are those which have been mentioned. —The elæolite-syenite from the vicinity of Rio de Janeiro, Brazil, has recently been carefully examined by Fr. Graeff.[3] The mass of the rock is described as possessing a holocrystalline hypidiomorphic structure. Its principal constituents are hornblende, orthoclase, elæolite, augite, and mica. The feldspar is noticeable for the possession of a parting[4] parallel to $7\ P\bar{\infty}$. In other cases it is intergrown with very fine lamellæ of plagioclase, thus showing striations when examined under the microscope in polarized light. The elæolite is generally fresh, but in some instances is altered into sodalite and analcite. The accessory minerals are titanite, apatite, zircon, fluorite, and a black garnet. The rock is interesting, as affording another example of the predominance of hornblende over augite in elæolite-syenites. In it are many little veins of a finer-grained elæolite-syenite, which show very clearly the effects of pressure, and which are remarkable for the number of accessory minerals they contain. A second variety of the rock, found as blocks in the Rio de Ouro, consists of elæolite, orthoclase, ægirine. and mica, together with a large number of accessory constituents. Among the latter are *rinkite* and *lavenite*. The former[5] occurs in long narrow plates marked by cleavage lines parallel to their longer axes. The mineral is

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[1] Edited by Dr. W. S. Bayley, Madison, Wisconsin.

[2] Min. u. Petrog. Mitth., viii., 1887, p. 356.

[3] Neues Jahrb. f. Min., etc., 1887, ii., p. 222.

[4] Cf. W. Cross, Monog. xii. U. S. Geol. Survey, p. 348, Mr. Cross finds a parting in the sanidine of the Leadville rhyolites. which is parallel to $\frac{15}{2}\ P\bar{\infty}$.

[5] Cf. American Naturalist, 1884, p. 1141.

slightly pleochroic in yellow tints. The plane of its optical axes is perpendicular to the cleavage. It is readily attacked by concentrated hydrochloric acid, with the separation of gelatinous silica. The lavenite[1] occurs in highly refractive, strongly pleochroic, honey-yellow crystals, and is closely associated with the magnesium-iron constituents. A third variety of the elæolite-syenite is porphyritically developed. It occurs in the form of a dyke in the holocrystalline rock described above, and contains inclusions of a finer-grained rock of the same general nature.—The massive rocks of the Leadville Region, according to Mr. W. Cross,[2] comprise quartz porphyries, rhyolites, andesites, porphyrites, and diorites. The porphyries are the most interesting, in consequence of their relation to the ore bodies. They are divided by Mr. Cross into several varieties, each of which is carefully described. That phase known as the Lincoln porphyry is noteworthy, as containing the rare accessory *allanite.*[3] The sanidines of some of the rhyolites possess a peculiar satiny lustre, due to fine partings parallel to $\frac{15}{2} P\overline{\infty}$. The cavities of these rocks are covered with little crystals of sanidine, quartz, biotite, and topaz. In the porphyrites biotite is frequently found in tiny green flakes with a very strong pleochroism, and rounded grains of quartz are sometimes surrounded by an aureole of quartz and feldspar. It is interesting to note that in certain cases epidote is the final product of alteration of all the minerals of the porphyrites, while in other cases this final product is muscovite.—J. F. Williams[4] has recently described, in a very finely illustrated paper, the trachytes composing Monte Amiata, in Tuscany. These trachytes by alteration yield products which approach very closely to rhyolite on the one hand, and on the other appear very like andesites. The paper is enriched by numerous analyses of feldspar, hypersthene, and types of trachyte. —In a late number of the *Neues Jahrbuch für Mineralogie,* Reusch[5] illustrates, in a very beautiful manner, the effects of pressure on sedimentary and massive rocks. In the case of conglomerates, he shows how a schistose structure may be induced which is entirely distinct from the bedding due to sedimentation.

METEORITES.—J. Bosscha[6] describes a meteorite which fell at Karang-Modo, on the island Java, on the 3d of October, 1883. Its thin sections show well-crystallized chondra in addition to enstatite, olivine, troilite, iron, and glass. After describing the structure of the meteorite in detail the author proceeds to discuss the various theories which have been proposed to account for the origin of these bodies. He shows the weakness of each, and immediately suggests a new one, in which meteorites are regarded as made up of little particles of cosmic substances, which together with the sun, planets, etc., compose the solar system. He shows how this substance might unite and give rise to a meteorite with the brecciated structure so

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[1] Cf. American Naturalist, 1887, p. 850.

[2] Monog. U. S. Geol. Survey, xii., Washington, p. 319.

[3] Cf. American Naturalist, 1885, p. 1098.

[4] Neues Jahrb. f. Min., etc., Beil. Bd. v., 1887, p. 381.

[5] Ib., v., 1887, p. 52.

[6] Ib., v., 1887, p. 126.

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frequently noticed, and concludes by giving several reasons for the acceptance of his theory.—A meteoric stone which fell at Angro des Reis, in Brazil, during 1867, contains a calcium-rich red augite as one of its constituents. It is consequently richer in calcium than any meteorite heretofore described. It belongs about midway between Rose's eukrites and howardites. Ludwig and Tschermak [1] propose to establish a new class of meteorites, of which this shall be the first member. They call it the augrite class.—A lithosiderite,[2] found last March in a field eight and a half miles west of Rockwood, Cumberland County, Tenn., consists of about 16 per cent. of metallic iron and 84 per cent. of a stony portion made up of anorthite and enstatite. The metallic grains are evenly distributed throughout the mass, and when polished and etched show the usual figures. The stony part presents a brecciated appearance. Through it are scattered the metallic nodules mentioned above, and others consisting of an iron-rich enstatite. It is unfortunate that the careful analyses of the constituent portions of this meteorite are unaccompanied by descriptions of its thin sections.—A meteoric stone having the composition given below is mentioned by Daubrée [3] as having fallen at Djati-Pengilon, in Java, on the 19th of March, 1884. Its specific gravity is 3.747. Weight, 166 kilograms. Composition :

Fe (Ni=10.78)	Troilite.	Olivine.	Bronzite.	Chromite.
21.3	5.1	33.4	39.0	0.1

It is the fourth meteorite known to have fallen in the neighborhood at various times.—Daubrée and Meunier [4] have examined pieces of meteoric stones, picked up after a meteoric shower which occurred near Grazac and Montpelegry, in Tarn, on August 10, 1885. They regard them as new types of carbonaceous meteorites. On account of the scarcity of material a complete chemical examination was not attempted. A few tests, however, showed the presence of sulphides, chlorides, olivine, a magnetic ingredient and carbonaceous matter. —Quite a large number of short papers recording the results of the analyses of meteoric irons have recently appeared in the journals. Mr. G. F. Kunz [5] has described the tenth meteoric iron actually seen to fall. Its fall took place on March 27, 1886, at Cabin Creek, Johnson County, Ark.—The same author reports [6] the analysis by Mr. Whitfield of a meteor from Scottsville, Allen County, Ky.—A mass of meteoric iron [7] ploughed up three years ago in a field in St. Croix County, Wisconsin, shows cubically arranged Widmanstättian figures, very much like those characterizing Meunier's jewellite group. —The Taney County, Missouri, meteorite and the meteoric irons from Chattooga County, Georgia, from Eastern Tennessee, from Waldron Ridge, and from Claiborne County, Tennessee, are briefly described by Mr. G. F. Kunz.[8]—A pallasite found at Campo de

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[1] Min. u. Petrog. Mitth., viii., 1887, p. 341.
[2] Amer. Jour. Sci., Nov., 1887, p. 387. J. E. Whitfield.
[3] Comptes Rendus, civ., 1887, p.
[4] Ib., p. 1771 and 1813.
[5] Amer. Jour. Sci., June, 1887, p. 494.
[6] Ib., p. 500.
[7] D. Fisher: ib., Nov., 1887, p. 381.
[8] Ib., Dec., 1887, p. 467.

Pucará, in the State of Catamarca, of the Argentine Republic, is very similar[1] in aspect and mineralogical composition to the pallasite of Imilac, Atacama.

NEW BOOKS.—The fourth and fifth parts of Professor von Gümbel's "Grundzüge der Geologie"[2] have just been received. They complete the first volume of the author's "Geology of Bavaria." In the two parts before us historical geology is completed. In addition to this there is an interesting chapter on the history of the development of the earth as a portion of the universe and as a member of the solar system. The high character of the illustrations, noticed in former reviews, is maintained, and the number of references is still further increased. The entire volume, exclusive of index, contains 1087 pages, 504 illustrations, and references to 414 topics.—Another very welcome addition to geological literature has appeared in the concluding part of the second volume of Roth's "Chemische Geologie."[3] This brochure embraces in its treatment the crystalline schists and the sedimentary rocks. Like the earlier portions of the same volume, this part is especially valuable for the copious references to articles relating to the spread and character of these important classes of rocks—classes which have hitherto been neglected by writers of handbooks of petrography. The lists of localities in which the different members of these great classes of rocks arefound is very full, except in the case of North America, where it seems that many localities have been overlooked. The book, however, is one which no geologist can well afford to be without.

MISCELLANEOUS.—Kroustschoff[4] has obtained little crystals of biotite by heating to a high temperature a mixture composed of basalt glass (fused basalt and acid rocks), biotite fragments, amorphous silica, potassium silico-fluoride and sodium and aluminium fluoride.—By fusing tin stone with sodium carbonate and sulphur at a low of temperature, for five or six hours, Genth[5] finds that little pyrite crystals are formed.—Alabandine is a regularly crystallizing manganese sulphide. It has been produced artificially by Baubigny,[6] by heating in a sealed tube to 100° the pink precipitate produced when hydrogen sulphide is passed through an acetic acid solution of manganese.—"Precious Stones in the United States" is the title of a very readable article, by G. F. Kunz,[7] in the December number of *Harper's New Monthly Magazine*. It is illustrated by a full-page lithographic plate of the most important gems found within the border of the United States.

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[1] E. Cohen: Neues Jahrb. f. Min., etc., 1857, ii., p. 45.

[2] Geologie von Bayern, Bd. I. Lief iv. v. Grundzüge der Geologie. Dr. K. W. von Gümbel. Kassel, 1887. Cf. American Naturalist, 1886, p. 1047.

[3] J. Roth: Allgemeine und Chemische Geologie, Bd. II. Abt. 3. Berlin, 1887. Cf. American Naturalist, 1885, p. 1215.

[4] Min. u. Petrog. Mitth., ix., 1887, p. 55.

[5] Contributions from the Chemical Laboratory of the University of Pennsylvania, 1887, p. 5.

[6] Comptes Rendus, civ., May, 1887, p. 1372.

[7] December, 1887, p. 97.

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MINERALOGY AND PETROGRAPHY.[1]

Petrographical News.—As the result of a recent trip through the southern extremity of Africa, E. Cohen[2] has succeeded in giving us quite a good deal of information regarding the Palæozoic formations of the Cape States. The pre-Devonian schists of the coast region have been treated in another place.[3] In the present paper the author confines himself to the various members of the Devonian and Carboniferous systems, and other formations overlying these. The most widespread rocks in this region are sandstones, graywackes and conglomerates. The Karroo formation (Triassic) Cohen divides into a lower, a middle and an upper series. The lower series comprises fragmental rocks with an occasional intercalated layer of an eruptive. The middle series is characterized by the number of layers of eruptives intruded between those of sedimentary rocks as well as by the number of dykes cutting across the latter. The eruptives, with a single exception, are plagioclase augite rocks. By far the larger proportion of these belong to the diabase family, many of them being olivine bearing. In the latter the pœcilitic structure is frequently well marked. The diabases, quartz diabases, proterobase and diabase porphyrites, of both the intercalated layers and the dykes, are regarded by Cohen (as the result of careful analyses) as mere phases of the same magma. The single exception to the prevailing plagioclase-augite eruptives mentioned above is in the case of a dyke-cutting olivine diabase. The material of this bears a strong resemblance to mica syenite. At the points where the diabase layers come in contact with the interstratified sandstone beds the latter have been subjected to considerable alteration. The unaltered rock is an ochre-yellow, fine grained sandstone, made up of quartz and colorless mica, besides a little iron hydroxide and earthy material. As it approaches the diabase it gradually loses all traces of its bedding planes, and in it is developed a green chloritic mineral, whose nature was not determined. Nearer to the eruptive the chloritic mineral increases in quantity, and in addition there is a development of biotite and a disappearance of the earthy material, which has probably gone to make up the biotite. In immediate contact with the diabase the sandstone has been entirely changed to a typical black hornfels. In it all the constituents have taken on a concretionary form. Analyses of the unaltered sandstone and of two typical altered phases teach that the change in the nature of the sedimentary rock is not due to any addition of diabase material. The dyke rocks produce but little alteration in the neighboring fragmentals. In one case, however, where a dyke cut sandstone, it was noticed that biotite plates were developed parallel to the sedimentary planes of the sandstone, while muscovite formed perpendicular to these planes. The remainder of the paper is devoted to a discussion of the upper members of the Karroo formation and to the Pleistocene deposits.

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[1] Edited by Dr. W. S. Bayley, Madison, Wisconsin.
[2] Neues Jahrb. f. Min., etc., 1887, Beil. Bd. v. p. 195.
[3] Ib., 1874, p. 460.

Another interesting paper is by K. Dalmer,[1] on the quartz trachyte of Campiglia, in Tuscany. The glassy variety of this quartz trachyte is a fine-grained gray rock, consisting of a glassy groundmass in which are porphyritic crystals of sanidine, quartz, biotite and cordierite, with occasional crystals of plagioclase. The quartz grains all possess a rounded outline in cross section, and are surrounded by a zone of glass. In addition to the minerals mentioned above there also occur in this variety prismatic crystals of some member of the scapolite group light red garnets, apatite and zircon. In a felsitic variety scapolite is lacking. In the neighborhood of the quartz grains the felsitic groundmass of the rock is replaced by a zone of glassy material. The cordierite is less fresh and it is in the glassy variety, and in many instances is entirely replaced by pinite. In a third variety, occurring in dykes, the groundmass is completely crystalline. These dykes of grano-porphyritic trachyte were regarded by Lotti[2] as quartz porphyries, and as apophyses of a so-called granite mass which occurs about fifteen hundred metres distant from them. This mass was likewise examined by Dalmer, who, while he finds it to possess the characteristics of a granite porphyry, believes that its present condition is due to the conditions under which it cooled, and that the three trachytes and the granite porphyry are all portions of the same magma, which, from the nature of its surroundings, gave rise to rocks which from their structure and mineralogical composition must be classified under different heads.

Professor C. R. Van Hise[3] communicates some additional[4] notes on the enlargement of hornblende and augite in fragmental and eruptive rocks. In the altered diabases of the Penokee-Gogebic Iron-Bearing Series crystals of uralitized augite are seen to have attached to them long acicular crystals of a very light green hornblende, which extend out from the uralite even into the surrounding decomposed feldspars. In other cases unaltered augite is surrounded by an almost continuous sheet of amphibole. In both cases the crystallographic axes of the two minerals coincide. Dr. G. H. Williams[5] describes the alteration of ilmenite into rutile, in altered diabase from the vicinity of Quinnesec, Mich. Irregularly-shaped pieces of ilmenite are surrounded by a network of little prismatic crystals of rutile.

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[1] Neues Jahrb. f. Min., etc., 1887, ii., p. 206.
[2] Atti della Societa Toscana. Vol. vii.
[3] Amer. Jour. Sci., May, 1887, p. 385.
[4] American Naturalist, Dec. 1885, p. 1216.
[5] Neues Jahrb. f. Min., etc., 1887, ii., p. 263.

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Alf. Gerhard[1] calls attention to the fact that most of the rocks described as soda-granites are really ordinary granites in which the proportion of sodium is little greater than is usually found in granites. The Ulfserud (Sweden) rock, however, appears really to contain a plagioclase approaching very near to albite in composition.

MINERALOGICAL NEWS.—*Dihydro-thenardite* is the name given by Markownikow[2] to a substance found in a thin colorless bed on the shore of Lake Gori, in the Gouvernement Tiflis, Russia. In composition it is a sodium sulphate differing from thenardite and mirabilite in appearance and its content of water. An analysis yielded 16.15 per cent. of water, corresponding to the formula $Na_2\,SO_4 + 2\,H_2\,O$. It crystallizes in the monoclinic system.—Laist and Norton[1] report the occurrence of a *new antimonide* from near Mytilene, Asia Minor. The new mineral resembles silver in color and lustre. It is massive and brittle. Its hardness is 4.-5. and its specific gravity 8.812. Upon analysis it yielded: Cu = 73.37 per cent., Sb = 26.86 per cent., corresponding to $Cu_{11}\,Sb_2$ (breithauptite = Ni Sb, dyscrasite = $Ag_3\,Sb - Ag_6\,Sb$.)—A *Barium manganite* from near Austinville, Wythe county, Virginia, according to Mr. Walker,[3] is of the following composition:

$Mn\,O_2$	$Mn\,O$	$Ba\,O$	$H_2\,O$	$Si\,O_2$	$(Fe_2\,O_3.\ Al_2\,O_3)$
68.86	7.51	14.42	5.08	1.98	2.23

It is found imbedded in psilomelane and ferruginous clay in the form of "radiating fine fibrous needles." Its color is brownish-black. Hardness = 1.5. Sp. Gr. = 3.27. It differs from varvicite ($Mn_4\,O_7 + H_2\,O$) and lepidophæite ($Cu\,Mn_6\,O_{12} + 9\,H_2\,O$) in containing Barium.[4] Its composition may be represented by the formula $Ba\,Mn_9\,O_{18} + {}_2O + 3\,H_2O$. In a letter to the *Neues Jahrbuch für Mineralogie* Darapsky[5] communicates the results of some analyses of certain Chilian zeolites and of a natural *amalgam* to which he ascribes the formula $Ag_{39}\,Hg$.—A black opaque mineral, associated with the tourmaline of Hamburg, N. J., and DeKalb, N. Y., Mr. Diller[6] thinks may be a fourth form of titanic oxide.

ROSENBUSCH'S "MASSIGE GESTEINE."—The second portion of Professor Rosenbusch's *Massige Gesteine*[7] fully sustains the good impression produced by the first part.[8] This concluding portion of the great handbook of petrography embraces in its treatment the effusive rocks, which are divided into the palæovolcanic and the neovolcanic classes. Under the former are included the quartz-porphyries, the quartz-free porphyries and keratophyres, the porphyrites, the augite-porphyrites and melaphyres, and the picrite-porphyrites. We miss here the elæolite porphyrites, which have been relegated to the questionable group of dyke rocks, and the quartz-porphyrites, which have been merged into the porphyrite family. The melaphyres are now members of the augite-porphyrite family, and the keratophyres have found a home among the quartz-free porphyries. There are nowhere as sharp distinctions made between rocks of different mineralogical and chemical compositions as were found in the first edition of the *Massige Gesteine*. The classification has become somewhat more complicated than the old one, but at the same time it seems more reasonable in the light of recent investigations. Among the neovolcanic rocks we find the liparites and pantellerites, the trachytes and quartz-free pantellerites, the phonolites, the dacites, the andesites, the basalts, the tephrites and basanites, the leucite rocks, the nepheline rocks, the melilite rocks and the limburgites and augitites. We here also miss a few familiar groups. The augite andesites are classed with the andesites. The tephrites and basanites have been united into one family. The entire group of glassy rocks has been eliminated, and the individual members have been included among those families of the neovolcanic rocks with which they are genetically connected. The discovery of a triclinic potassium sodium feldspar by Förstner[1] in the sodium-rich liparites of the island Pantelleria has resulted in the separation of the old liparite family into two subfamilies—the liparites proper, containing sanidine, and the pantellerites containing anorthoclase as their principal feldspathic constituents. Each family among both the palæovolcanic and the neovolcanic effusives is composed of numerous species or varieties, each one of which is characterized by definite properties, as structure, composition, etc., which distinguish it from other members of the same family. But it would require too much space even to mention here the numerous members of the effusive rocks, and would serve but little purpose. The petrographer must study the *Massige Gesteine* if he would keep abreast of his science, and to no others would a detailed discussion of the many new suggestions contained in the book be interesting.

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[1] Ib., 1887, ii., p. 267.

[2] Jour. d. russ. phys.-chem. Gesells. 1887 [I], p. 252; Ref. Ber. d. deutsch. chem. Gesells., 1887, p. 546

[3] Amer. Chem. Jour., x., Jan. 1886, p. 60.

[4] Ib., p. 41.

[5] Neues Jahrb. f. Min., etc., 1888, i., p. 65.

[6] Amer. Jour. Sci., Jan. 1888, p. 51.

[7] Mikroskopische Physiographie der Massigen Gesteine, 2 Abt. Stuttgart, 1887.

[8] American Naturalist, Feb. 1887, p. 172.

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[1] Zeits. f. Kryst., 1877, i., p. 547, and 1883, viii., p. 125.

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MINERALOGY AND PETROGRAPHY.[1]

PETROGRAPHICAL NEWS.—In an article on the contact phenomena presented by certain Scottish olivine diabases, cutting sandstones and shales, Stecher[2] gives us some new and important ideas on the general subject of contact action. These olivine diabases are carefully described in all their varieties. Skeleton crystals of apatite, corroded augites, twinned plagioclase, dihexahedra of quartz, and various rare minerals are noted in them. The quartz shows anomalous action in polarized light, and is peculiar in that its hexagonal sections are seen under crossed nicols to consist of a kernel of quartz substance, surrounded by a rim of calcite. In some instances the olivine yields analcite by alteration. The most interesting portion of the paper is that which treats of the endogenous changes which have taken place in the dykes under the influence of the intruded rocks. Although more acid on their edges and in the neighborhood of sandstone inclusions, it was found that only in these places in the dykes is there any considerable development of olivine in perfect crystals. At a somewhat greater distance from the contact, the olivine becomes more skeleton-like in form. In the centre of the dykes it is absent. This is accounted for by Stecher in supposing that the material of the dykes cooled quickly on its edges, and thus preserved in their entirety the olivine which had already crystallized before the rock reached the surface of the earth. As the inner portion cooled more gradually, the magma became more acid as it dissolved material from the sandstone and slate pieces, torn from its walls, and thus re-dissolved the olivine, and then solidified under the changed conditions.—In contrast to the results obtained by Stecher, in which the effect of contact action is seen only in the eruptive rock, are those obtained by Greimi[3] in his studies of the phenomena presented by the intrusion of the Upper-Devon-

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[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Maine.

[2] Min. u. Petrog. Mitth. ix., 1887, p. 145.

[3] Neues Jahrb. f. Min., etc., 188~~7~~, i., p. 1. 8

ian schists by diabase, in the neighborhood of Weilburg and the Lahn, in Hessen, Nassau. In this case the diabase itself has suffered little alteration, but the schists show to a greater or less degree the effects of metamorphic action. The unaltered schists are composed of quartz, muscovite, hematite and other iron oxides, in which are lenticular areas and beds of calcite. Where altered they are seen to contain an isotropic groundmass in which are quartz, mica and a chloritic mineral. In addition to these the two newly formed minerals spinel and andalusite occur. In discussing his results, Greim concludes that the diabase supplied sodium and iron to the schists, which then underwent the alteration which is supposed by Rosenbusch to be characteristic of deep-seated metamorphism. —A third excellent paper on contact phenomena is that communicated by Rüdemann. This author has investigated the effect of the granite occurring at Reuth, near Gefrees, in the Fichtelgebirge, upon the clay slates, phyllites and amphibolites through which it cuts. He carefully describes the knotty-schists (Knoten-schiefer), the chiastolite and andalusite schists, and the hornfels resulting from this action, and reaches some general conclusions relative to the way in which an eruptive rock acts in the production of what are commonly known as contact rocks. In both phyllites and clay slates the first result of the metamorphic action is the concentration of certain of their constituents to form the spots (Knoten). In this stage there is little or no other change to be detected. The next stage is characterized by the formation of porphyritic crystals, chiastolite in the clay slates of Reuth and other localities, and biotite in the case of phyllites (Garbenschiefer). In the first case the andalusite owes its origin to the alteration of a light green chloritic mineral (grümbelite). In the case of the phyllites biotite replaces chlorite. In the third stage the end product of the alteration both of clay slates and phyllites is hornfels. This is a crystalline rock composed of quartz, biotite, muscovite and andalusite grains. Assuming that these changes in the sedimentary beds are directly connected with the presence of the large granite mass which they surround, the author supposes the earlier stages in the alteration to be due to the intense heating to which the rocks were subjected at the time of their intrusion by the granite. This is shown by the fact that in different beds different contact minerals have been produced, while the composition of the altered rocks corresponds to that of the corresponding unaltered beds from which they were derived. To account for the formation of hornfels, and the minerals so commonly found in it, Rüdemann supposes the energetic action of hot waters upon the constituents of the fragmental rocks. The paper is exceedingly well written, and contains very much of interest.—In connection with the discussion of

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[1] Neues Jahrb. f. Min. etc., B. B. v., p. 643.

contact phenomena, a late paper by Hussak,[1] on the origin of the spots in altered sedimentary rocks (Knoten-and Frucht-schiefer) is worthy of close study. Rosenbusch regards these spots as due to the aggregation of the pigment, which was distributed evenly throughout the fragmental rocks before their intrusion by the eruptives. In certain cases he supposes these aggregations to pass by recrystallization into chiastolite and andalusite. Ward regards them as undeveloped andalusites. Other writers have described them as possessing characteristics which indicate their close connection with other mineral species. Hussak, upon examining the spotted schists from Tirpersdorf, Saxony and Hlinsko, Bohemia, found that the darker portions of the altered schists possess properties which can only be explained by supposing them to be the remains of altered cordierite, in the case of the Saxon rocks, and of altered chiastolites and andalusites in the rocks from Bohemia.

MINERALOGICAL NEWS.—Busz[2] has recently made quite an extensive study of *sphene* in order to determine whether the optical properties of different crystals are in any way dependent upon their chemical composition. Although quite a number of analyses of well crystallized specimens from various localities were made, no direct relation could be traced between their compositions and optical properties. The most instructive portion of the paper is that which treats of the crystallography of the subject. Crystals of nine different types are pictured on three lithographic plates. A number of new forms were detected, which added to those already known make a total of seventy-five thus far identified on the species.—Köchlin[3] has examined several of the oxides of manganese to decide as to the correctness of certain views held in regard to them. He finds as the result of etching that *manganite* is holohedral as Groth supposed. He believes *polianite* to exist as an independent mineral species distinct from manganite. It is orthorhombic, with an axial ratio: 1 : 10513; 1 : 0.63177. Finally, he regards *pyrolusite* as a mixture without a definite composition. "Its substance is not individualized; it has no proper crystal form." It occurs almost exclusively as a decomposition product of other manganese minerals.—Although *pseudobrookite* was first described by Koch[4] some ten years ago, our knowledge of its optical properties is very limited. A new discovery of little crystals of the mineral in a nephelinite from Katzenbuckel has given Lattermann[5] the opportunity to determine its optical constants. The tiny crystals are bounded by the planes $\infty P \bar{\infty}$, $\infty P \breve{\infty}$, ∞P and $\frac{1}{3} P \bar{\infty}$. Their color is orange brown. They are weakly pleochroic. The plane of their optical axes is the basal pinacoid, and the axial angle, measured in oil, is 85° 30′. *A* is the acute bisectrix. The mineral is insoluble in hydrochloric acid. It dissolves slowly in boiling sulphuric acid, but rapidly in a mixture of sulphuric and hydrochloric acids. An analyses of separated material yielded: $Tio_2 = 46.79\%$; $Fe_20_3 = 48.64\%$ $Mgo = 4.53\%$. Very beautiful rich red, transparent crystals of *rhodochrosite* are described by G. F. Kunz[1] from the John Reed mine in Alicante, Lake co., Colorado. Some of the crystals from this locality "are as pellucid as red Iceland span and show the same double refraction." The same author[2] describes some curious groups of quartz crystals from the vicinity of the town of Pinal, Pinal CO., Arizona. Six or more little crystals of the usual form are so arranged as to form a hollow cylinder, with the general outline of a large quartz crystal. He also mentions a white opaque variety of hydrophane from Colorado, which is remarkable in that it can absorb more than its own volume of water. When wet it is perfectly transparent.—Mr. R. B. Riggs[3] of the United States Geological Survey has published the results of the analyses of a suite of tourmaline crystals from various localities. The conclusions reached by Mr. Riggs, after an immense amount of very careful work, are of very great interest as establishing with a good deal of accuracy the composition of this complicated group of minerals. The figures obtained lead the author to regard tourmaline as a simple boro-silicate with the general formula $R_9\ Bo_2\ (S\ i\ O_4)_2$, which for the three types recognized by him became:

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[1] Min. u. Petrog. Notizen, Bonn.

[2] Neues Jahrb. f. Min., etc.. Beil. Bd. v., p. 330.

[3] Min. u. Petrog. Mitth. ix., 1887, p. 22.

[4] Min. u. Petrog. Mitth. ,1878, i., p. 344.

[5] Min. u. Petrog. Mitth. ix., 1887, p. 47.

I. Lithia tourmaline $= 12\ SiO_2.\ 3B_2O_3.\ 4H_2O.\ 8A\overset{\ell}{\cancel{L}}_2O_3.\ 2\ (NaLi)_2O.$

II. Iron tourmaline $= 12\ SiO_2.\ 3\ B_2O_3.\ 4H_2o.\ 7A\overset{\ell}{\cancel{L}}_2O_3.\ 4\ Fe.O.\ Na_2O.$

III. Magnesia tourmaline $= 12\ SiO_2.\ 3B_2O_3.\ 4H_2O.\ 5A\overset{\ell}{\cancel{L}}_2O_3.\ \frac{28}{3}\ MgO.\ \frac{2}{3}\ Na_2O.$

It is interesting to note that while the color of the iron and magnesian varieties depends upon the *amount* of iron in their compositions, in the case of the lithium varities, containing manganese and iron, it depends upon the *ratio* between the manganese and iron constituent, being colorless, pink or pale green when the amounts of these are equal, red when manganese is in excess, and green or blue when iron is in larger quantity.

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[1] Amer. Jour. Sci., Dec. 1887, p. 477.

[2] Ib., p. 479.

[3] Ib., Jan., 1888, p. 35.

MINERALOGY AND PETROGRAPHY.[1]

PETROGRAPHICAL NEWS.—The very interesting paper by Brauns[2] S on the palæopicrite of Amelose, near Biedenkopf in Hessen Nassau, contains a full description of this rock and its numerous alterative ru products. The freshest type of the palæopicrite is composed of idiomorphic olivine, augite, both idiomorphic and allotriomorphic, irregular grains of plagioclose, picotite and magnetite. The augite often shows the unusual alteration into biotite. The principal alteration products of the rock are serpentine, siliciophite, chrysolite, metaxite, picrolite, webskyite,[3] calcite and quartz. The three substances chrysolite, metaxite and picrolite are studied in great detail, and their optical and physical properties are described at length. The author regards them each as a variety of serpentine, the first consisting of slender elastic fibres, the second of coarse stiff needles, and the third being characterized by a radiating structure.

The serpentines, amphibolites and eclogites from the neighborhood of Marienbad, in Bohemia, were formerly regarded as sedimentary beds which had been metamorphosed by the action of granite, which occurs near them in a boss. Patton has recently examined these rocks very carefully. He considers[4] them as probably the result of the action of dynamic agencies upon eruptive rocks. The serpentines are shown to be derived from a peridotite, composed sometimes of bronzite, hornblende and olivine, and at other times essentially of olivine and tremolite. Different specimens of amphibolites contain zoisite, epidote, augite and talc. The most interesting rocks discussed in the paper are the eclogites. A variety which the author calls kelyphite-eclogite is made up of garnets and hornblende in a groundmass consisting of amphibole and omphacite, so intergrown as to imitate the granophyre structure of certain acid rocks. The garnets are frequently surrounded by a rim of hornblende and plagioclose, which, however, the author is disinclined to regard as a reaction rim, but is rather disposed to look upon as a growth around the garnet as a center. Zoisite, which is also found in these eclogites, is often seen in the thin section to be surrounded by a rim of cloudy substance, which under high powers is resolved into plagioclose, muscovite and a third mineral with the specific gravity and optical properties of topaz, but in which no fluorine could be discovered. Patton supposes it to be an unknown mineral with the composition $Al_2\ Si\ O_5$.—The saussurite gabbros of the Fichtelgebirge, found in lenticular masses scattered through serpentine layers, which are interstratified with clay slates and phyllites, are regarded by Michael[1] as the result of the alteration of a sedimentary feldspathic gabbro, although it would seem, from his own descriptions, that he would have been equally well justified in concluding that the saussurite gabbro lenses are merely the less altered remains of an intercalated gabbro, whose most altered phases are now represented by the serpentine. The word "saussurite" he would use as a general term to designate a cloudy alteration of plagioclose into two or more distinct minerals. He finds that while in some cases this alteration is into zoisite and serpentine, or some indeterminable mineral, in other cases the new minerals produced are serpentine and a calcium garnet.

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[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Maine.

[2] Neues Jahrb. f. Min., etc., B. B. v., p. 276.

[3] American Naturalist, Nov., 1887, p. 1021.

[4] Min. u. Petrog. Mitth., 1887, ix., p. 89.

Mr. Lawson,[2] of the Geological Survey of Canada, gives an account of the diabase dykes so prevalent in the Archæan region around Rainy Lake. These dykes have a width of from sixty to one hundred and fifty feet. Toward their centers they are composed of plagioclose, augite and quartz, with a greater or less proportion of colorless garnets. The augite appears as an aggregate of little crystals which fill the spaces between the other constituents, and not as one continuous crystal, as is the usual case among diabases. The quartz and garnets are found only toward the centers of the dykes, and are absent at their edges. Idiomorphic enstatite, on the contrary, is a frequent constituent of material taken from the sides of the dykes, and is absent from their centers. The features of these diabases are well worthy of the further study Mr. Lawson proposes to put upon them.—The Rev. E. Hill[1] mentions hornblende schists from the island of Sark, in which he thinks he has found indications of a former bedding and evidences of sedimentation.—Ternier[2] describes very briefly the eruptive rocks of the Mt. Mézeuc region in France, as presenting almost as great a diversity as those of Auvergne. They consist of augite and amphibole andesites, trachytes, phonolitic-trachytes and basalts in the order of their sequence. The basalts are the only ones which are at all widespread in their occurrence.

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[1] Neues Jahrb. f. Min., 1888, i., p. 32.

[2] Proceedings Can. Institute for 1887, and American Geologist, April, 1888.

MINERALOGICAL NEWS.—New analyses of several rare minerals are communicated from the laboratory of the University of Virginia. Mr. R. C. Price[3] found a lump of *tscheffkinite*, from Nelson county, Va., to possess the composition $2\,R\,O.\,R_2\,O_3.\,5(Si\,Ti)_2\,O_2$, in which $R = Ca, Be, Fe, Mg$, and $R_2 = Ce, Di, La$ and $Fe.'''$
Mr. Walker[4] obtained from *genthite*[5] :—

$Si\,O_2$	$Ni\,O_2$	$Mg\,O$	$H_2\,O$	$Fe_2\,O_3$
55.38	17.84	15.62	10.77	.56

corresponding to $\frac{1}{3}\,H_2\,O + \frac{2}{3}\,[(Mg\ Ni)\,O].\,Si\,O_2 + \frac{1}{3}\,H_2\,O$, a meerschaum (sepiolite) with its magnesium partly replaced by nickel. The mineral occurs in thin layers in a sandstone at Webster, Jackson county, N. C. It is amorphous, of a light apple-green color, translucent and greasy. It has a hardness of 2.5 and a specific gravity of 2.53.—Very similar to the last mentioned mineral is a nickeliferous *talc*, from the same locality, in which Mr. Bachman[6] found :—

$Si\,O_2$	$Ni\,O_2$	$Mg\,O$	$Fe_2\,O_3$	$Al_2\,O_3$	$H_2\,O$
53.91	15.91	19.39	1.46	2.65	6.30

—Perimorphs of *pyromorphite* after cerussite and galena are mentioned by Gonnard[7] as occurring in the lead mines of the Puy-de-Dôme, France. In some cases the pyromorphite exists merely as a thin shell enclosing a hollow space, from which the mineral formerly occupying it has been removed by solutions—The same author describes a shell, composed of little rhombohedra of siderite arranged with their axes parallel, enclosing within itself a solution of ferrous carbonate. He also calls attention to a perimorph of pyrite after calcite.—Hall and Tauss[8] have found the

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[1] Quart. Jour. Geol. Soc., Aug., 1887, p. 322.
[2] Comptes Rendus, cv., 1887, p. 1141.
[3] Amer. Chem. Jour., Jan., 1888, x., p. 38.
[4] Amer. Chem. Jour., Jan., 1888, x., p. 44.
[5] Chem. News, xxvi., p. 654.
[6] Amer. Chem. Jour., Jan., 1888, x., p. 45.
[7] Comptes Rendus, cv., 1887, p. 1267.
[8] Min. u. Petrog. Mitth., ix., 1887, p. 227.

baryto-celestite, accompanying the wagnerite at Werfen in Salzburg, to consist of 84.8 per cent. of barium sulphate and 15.05 per cent. of strontium sulphate. Like Professor Chester,[1] they regard the substance as an isomorphous mixture rather than as a definite compound.

MISCELLANEOUS.—*Wollastonite* is most frequently found in nature as a newly formed mineral in metamorphic rocks. It has also been detected as a primary constituent in eruptive rocks. Many experimenters have succeeded in obtaining the mineral artificially by means of wet processes, but until very recently all attempts to produce it in the dry way have failed. Doelter,[2] as the result of his experiments, declared that wollastonite could be produced only by wet methods, or at low temperatures in the presence of water vapor. The bearing of such a statement upon the question of the origin of eruptive rocks, is of the greatest importance if found to hold good. Hussak,[3] however, shows that the mineral can be produced by dry methods. He has succeeded in obtaining little monoclinic crystals of wollastonite by fusing together a mixture composed of three parts of $Ca\,Si\,O_3$ and one part of a glass of the composition $3\,Na_2\,O.\,Si\,O_2 + 2\,Ca\,B_2\,O_3$. When examined under the microscope these crystals were seen to possess all the properties of the natural wollastonite.—The anhydrous manganese hydroxide *pyrochroite* ($Mn\,(O\,H)_2$) has been obtained by Schulten[4] in little hexagonal prisms, perfectly transparent, of a light red tint, and with a negative refractive index. His mode of operation was to warm a little manganese chloride with a large excess of a solution of pure potassium hydroxide, care being observed to prevent the access of air during the operation.—Among the large number of artificial crystals made by the late Dr. Ebelmen, Mallard[5] describes one of some interest to mineralogists. It was produced by fusing together a mixture of silica, glucina and borax. In the resulting product were large numbers of little prisms of a positively refracting substance, which corresponded in its properties with the rare mineral *phenacite* ($Be_2\,Si\,O_4$).—Krüss[6] has found that *euxenite* from Norway contains a tenth of one per cent. of the newly discovered element germanium.—Traube[7] notes that the zeolites found in the Striegau granite are colorless when occurring at great depths, but when near the surface are highly colored.

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[1] American Naturalist, 1887, p. 852.
[2] Neues Jahrb. f. Min., etc., 1886, i., p. 119.
[3] Mineralogische und Petrographische Notizen, Bonn. p. 9.
[4] Comptes Rendus, cv., 1887, p. 1265.
[5] Comptes Rendus, cv., 1887, p. 1260.
[6] Ber. d. d. Chem. Gesell., 1888, p. 131.
[7] Neues Jahrb. f. Min., etc., 1887, ii., p. 67.

MINERALOGY AND PETROGRAPHY.[1]

(Extracted from the May number of the AMERICAN NATURALIST.)

PETROGRAPHICAL NEWS.—Among the rocks gathered by Reyer[2] during a journey through the Sierra Nevada Mountains, Schuster[3] has found the following principal types: biotite granites, containing microcline and pilitized biotite; saussurite-diorite and quartz-diorite, containing orthoclase; saussurite, pilite, and biotite gabbros; quartz-porphyrites, kersantites, andesites, serpentine, fragmental rocks, and tufas. Although the paper in which these rocks are described consists merely of detailed descriptions of detached rock-specimens, it nevertheless contains many points of considerable interest. Pyrophyllite is mentioned as an alteration product of olivine and of plagioclase; reaction rims around augite and olivine are pictured; intergrowths of biotite and augite, of biotite and hornblende, and the alteration of biotite into pilite and into hornblende, are each described. Chromium mica is mentioned as occurring in a magnesite concretion in serpentine; helminth, as a constituent of a diabase porphyrite, and anorthoclase, as existing in a hornblende porphyrite. A most interesting case of intergrowth is that in which a long, tabular crystal of plagioclase penetrates diallage in such a way that its long edges are parallel to the orthopinacoid of the augite, and its twining lamellæ are parallel to the lines of inclusions in this mineral. Indications of the effects of pressure were seen in a large number of the sections examined.——Dr. Wadsworth[4] has recently published a report embracing preliminary descriptions of the peridotites, gabbros, diabases, and other rocks of

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[2] Neues Jahrb. f. Minn., etc. Beil. Bd. v., p. 451.

[3] Ib., Beil. Bd. iv., p. 291.

[4] Geolog. and Nat. Hist. Survey of Minnesota, Bulletin No. 2. Minneapolis, 1887

baryto-celestite, accompanying the wagnerite at Werfen in Salzburg, to consist of 84.8 per cent. of barium sulphate and 15.05 per cent. of strontium sulphate. Like Professor Chester,[1] they regard the substance as an isomorphous mixture rather than as a definite compound.

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[4] Geolog. and Nat. Hist. Survey of Minnesota, Bulletin No. 2. Minne-

baryto-celestite, accompanying the wagnerite at Werfen in Salzburg, to consist of 84.8 per cent. of barium sulphate and 15.05 per cent. of strontium sulphate. Like Professor Chester,[1] they regard the substance as an isomorphous mixture rather than as a definite compound.

MISCELLANEOUS.—*Wollastonite* is most frequently found in nature as a newly formed mineral in metamorphic rocks. It has also been detected as a primary constituent in eruptive rocks. Many experimenters have succeeded in obtaining the mineral artificially by means of wet processes, but until very recently all attempts to produce it in the dry way have failed. Doelter,[2] as the result of his experiments, declared that wollastonite could be produced only by wet methods, or at low temperatures in the presence of water vapor. The bearing of such a statement upon the question of the origin of eruptive rocks, is of the greatest importance if found to hold good. Hussak,[3] however, shows that the mineral can be produced by dry methods. He has succeeded in obtaining little monoclinic crystals of wollastonite by fusing together a mixture composed of three parts of $Ca\ Si\ O_3$ and one part of a glass of the composition $3\ Na_2\ O.\ Si\ O_2 + 2\ Ca\ B_2\ O_3$. When examined under the microscope these crystals were seen to possess all the properties of the natural wollastonite.—The anhydrous manganese hydroxide *pyrochroite* ($Mn\ (O\ H)_2$) has been obtained by Schulten[4] in little hexagonal prisms, perfectly transparent, of a light red tint, and with a negative refractive index. His mode of operation was to warm a little manganese chloride with a large excess of a solution of pure potassium hydroxide, care being observed to prevent the access of air during the operation.—Among the large number of artificial crystals made by the late Dr. Ebelmen, Mallard[5] describes one of some interest to mineralogists. It was produced by fusing together a mixture of silica, glucina and borax. In the resulting product were large numbers of little prisms of a positively refracting substance, which corresponded in its properties with the rare mineral *phenacite* ($Be_2\ Si\ O_4$).—Krüss[6] has found that *euxenite* from Norway contains a tenth of one per cent. of the newly discovered element germanium.—Traube[7] notes that the zeolites found in the Striegau granite are colorless when occurring at great depths, but when near the surface are highly colored.

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[1] American Naturalist, 1887, p. 852.
[2] Neues Jahrb. f. Min., etc., 1886, i., p. 119.
[3] Mineralogische und Petrographische Notizen, Bonn. p. 9.
[4] Comptes Rendus, cv., 1887, p. 1265.
[5] Comptes Rendus, cv., 1887, p. 1260.
[6] Ber. d. d. Chem. Gesell., 1888, p. 131.
[7] Neues Jahrb. f. Min., etc., 1887, ii., p. 67.

MINERALOGY AND PETROGRAPHY.[1]

(Extracted from the May number of the AMERICAN NATURALIST.)

PETROGRAPHICAL NEWS.—Among the rocks gathered by Reyer[2] during a journey through the Sierra Nevada Mountains, Schuster[3] has found the following principal types: biotite granites, containing microcline and pilitized biotite; saussurite-diorite and quartz-diorite, containing orthoclase; saussurite, pilite, and biotite gabbros; quartz-porphyrites, kersantites, andesites, serpentine, fragmental rocks, and tufas. Although the paper in which these rocks are described consists merely of detailed descriptions of detached rock-specimens, it nevertheless contains many points of considerable interest. Pyrophyllite is mentioned as an alteration product of olivine and of plagioclase; reaction rims around augite and olivine are pictured; intergrowths of biotite and augite, of biotite and hornblende, and the alteration of biotite into pilite and into hornblende, are each described. Chromium mica is mentioned as occurring in a magnesite concretion in serpentine; helminth, as a constituent of a diabase porphyrite, and anorthoclase, as existing in a hornblende porphyrite. A most interesting case of intergrowth is that in which a long, tabular crystal of plagioclase penetrates diallage in such a way that its long edges are parallel to the orthopinacoid of the augite, and its twining lamellæ are parallel to the lines of inclusions in this mineral. Indications of the effects of pressure were seen in a large number of the sections examined.——Dr. Wadsworth[4] has recently published a report embracing preliminary descriptions of the peridotites, gabbros, diabases, and other rocks of

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[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Me.
[2] Neues Jahrb. f. Minn., etc. Beil. Bd. v., p. 451.
[3] Ib., Beil. Bd. iv., p. 291.
[4] Geolog. and Nat. Hist. Survey of Minnesota, Bulletin No. 2. Minne-

Minnesota. The report opens with a restatement of the author's views in regard to the classification of massive rocks[1] and a plea for the more careful discussion of the altered forms of rocks, with reference to the original forms from which they have been derived. The rocks described in this bulletin are typical specimens which have been collected from all over the northern portion of Minnesota by various members of the State Survey during the past few years. They are, therefore, not studied in their field relations to one another. The gabbros and diabases are the most widespread, and are regarded as very closely connected. Among the altered forms of gabbro are placed Irving's orthoclase gabbros[2] and most of his augite syenites, though some of the latter may possibly be altered forms of more acid rocks. Biotite as a secondary product, due to the reaction between magnetite and feldspar, and the same mineral, occurring as an alteration product of pyroxene, are described and figured. Norites, serpentines, hornblende-porphyrites, and many diabases are also briefly described. Lack of time and the impossibility of studying some of the most interesting of the rocks in their field relations prevented Dr. Wadsworth from elaborating many of the points which he has been able merely to indicate in his report.

The rocks comprising the three mountains in the Rhone region—known as Linsberg, Ulmenstein, and Pietzelstein—have been carefully investigated by Möller.[3] This author finds Linsberg to consist principally of a porphyritic rock composed of sanidine, andesine, augite, and nepheline, together with a few other minerals in small quantity. In the rock from near the top of the mountain the plagioclase predominates over sanidine, while in the specimens taken from its sides sanidine is more abundant. The former Möller calls tephrite, the latter phonolite. In the phonolite, corroded grains of hornblende are often surrounded by rims of augite. Associated with these rocks, but in smaller quantity, is a dark nepheline basanite containing corroded augite crystals surrounded by zones of the same mineral, with a similar optical orientation, but a little different composition. The main portion of the rock composing Ulmenstein is a nepheline basanite which, by the subordination of its feldspar, locally passes into limburgite. Some of the larger of the feldspar crystals in this rock show the hour-glass structure frequently seen in augite. The rock of Pietzelstein is a nepheline basalt. Very detailed analyses of specimens of all these rocks are given, and each is very minutely described.——According to Harker,[4] most of the dyke-rocks of the Island Anglesey, off the northwest coast of Wales, are diabases and augite porphyrites. One of these dykes cutting a calcareous shale has converted this rock into a lydianite, in which calcite, clusters of garnet, and analcite crystals are developed. Other dykes from the northern portion of the island appear to consist of hornblende and biotite picrites. In one case newly formed, almost colorless hornblende is described as forming a cement between crystals of original hornblende, in a manner analogous to the quartz cement in indurated quartzites.

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[1] American Naturalist, 1885, p. 497.

[2] Copper-Bearing Rocks. Monog. V., U. S. Geol. Survey.

[3] Neues Jahrb. f. Minn., etc. 1888. I., p. 81.

[4] Geol. Magazine, 1887, Sept., p. 410, and Dec., p. 545.

MINERALOGICAL NEWS.—The diamonds found in the Province of Minas Geraes, Brazil, are associated with the oxides of titanium, martite, monazite, and xenotine. They are usually found in quaternary alluvial deposits, but have their origin, according to Gorceix,[1] in the itacolumites and mica schists which are archæan. In these rocks they occur in deposits analogous to those of topaz, anatase, rutite, etc. All these minerals occupy well-defined bands in the itacolumite, and are original in it, and are not derived from some older rock, whose detritus supplied the material for the itacolumite and the mica schist. This explanation of the origin of Brazilian diamonds is quite different from that offered[2] in the case of diamonds of the African and American fields.——*Polianite*, the anhydrous manganese dioxide, has heretofore not been found in sufficiently well-crystallized specimens to admit of a satisfactory determination of its crystallographic constituents. The investigations[3] seemed to point to an orthorhombic symmetry for it. Messrs. Dana and Penfield[4] have recently proven it to be tetragonal and isomorphous with cassiterite, with $a : c = 1 : .66467$. The crystals examined are composite, being composed of several tetragonal individuals which produce a body with an orthorhombic habit. Their specific gravity is 4.992, and their composition as follows:—

MnO	O	Fe_2O_3	SiO_2	H_2O	Insoluble.
80.81	18.16	.16	.36	.28	.16,

revealing a very pure manganese dioxide.——In the basalt from the neighborhood of Périer (Puy de Dôme) are little veins of clayey material[5] in which are imbedded crystals of augite and lozenge-shaped flat plates of *feldspar*. The plates are sections parallel to the clinopinacoid, bounded by the planes oP and $P\overline{\infty}$ equally developed. They are frequently twinned with $\infty P\overline{\infty}$ as the composition face.——Jannetaz[6] has analyzed *uranite* from the Island of Madagascar, with this result:—
——Igelström[7] has discovered a manganese, rich and antimony-

P_2O_5	NO_2	Fe_2O_3	CaO	Loss (water).
14.93	55.08	1.365	6.51	22.08

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[1] Comptes Rendus, cv , 1887, p. 1139.
[2] American Naturalist, 1887, p. 664.
[3] American Naturalist, March, 1888, p. 249.
[4] Amer. Jour. Sci., March 1888, p. 243.
Lévy : Bull. d. l. Soc. Franç. d. Miner., X., 1887, p. 69.
Ib., p. 47.
Bull. Soc. Franç. d. Min., ix., 1887, p. 218.

bearing *berzellite*, associated with barite, tephroite, calcite, and hausmannite, in veins and nests in the vicinity of Sjögrufan, Grythyttan parish, Örebro, Sweden. The new mineral, to which the name *pyrrhoarsenite* has been given, has a color resembling that of crocoite. It has a hardness of 4, and is soluble in hydrochloric acid. It possesses the optical properties of berzellite, and a composition as follows:—

$As_2O_5+Sb_2O_5$	MnO	CaO	MgO	SiO_2	H_2O	$Al_2O_3+Fe_2O_3$
58.06	17.96	18.68	3.58	1.02	.85	traces.

which may be represented by the formula $(Ca,Mn.,Mg)_3(As, Sb)_2O_8$.

MISCELLANEOUS.—Cohen[1] has re-investigated the subject of the pleochroic halos (Höfe) in the biotites of granite and gneiss, and is thereby led to the conclusion that they are produced by the accumulation of organic substances in the neighborhood of the inclusions they surround, and are not due to the aggregation of mica molecules richer in iron than those forming the main portion of the mineral in which the halos occur. He finds, contrary to the experience of Lévy,[2] that the halos are not affected by treatment with hydrochloric acid, as they should be if they contain a large proportion of iron, but that they are destroyed by heating to a temperature considerably higher than that which is necessary to obliterate the halos in muscovite and cordierite, in which minerals this phenomena is now generally believed to be due in some way to an organic substance.——Franklinite, together with its natural associate, zincite, has been artificially produced by Gorgeu[3] by subjecting to a cherry-red heat an intimate mixture of one part of sodium sulphate, one-half part of zinc sulphate, a quarter to a half part of ferric sulphate, and a little manganese sulphate.[4]

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[1] Neues Jahrb. f. Min., etc. 1888. I., p. 165.

[2] Comptes Rendus, xciv., 1882, p. 1196.

[3] Bull. Soc. Franç. d. Min., x., 1887, p. 50.

[4] Cf. American Naturalist, 1887, p. 475.

MINERALOGY AND PETROGRAPHY.[1]

(From the AMERICAN NATURALIST, June, 1888.)

PETROGRAPHICAL NEWS.—In a preliminary notice of the rocks occurring in the neighborhood of Ilchester, Howard county, Md., Mr. Hobbs[2] describes some interesting features of the eruptive masses of the region. The oldest rock within the area studied is a hypersthene-gabbro with its associated alteration products.[3] In the gabbro diorite, originating by dynamic metamorphism from the massive hypersthene-gabbro, ilmenite and rutile are found to be so associated with sphene as to lead the author to regard the rutile as an intermediate product in the alteration of ilmenite to sphene. The end product in the alteration of the gabbro is a typical hornblende-gneiss, in which peripheral granulation of the original feldspar can be detected. A quartz-mica-diorite, in which the quartz is in porphyritic crystals, contains about equal proportions of orthoclase and plagioclase. The most common form of granite, cutting the gabbros and allied rocks, is a coarse pegmatite in which microcline crystals a foot in diameter are sometimesobserved. A less common form of granite is a gneissic granite-porphyry, most interesting on account of the occurrence in it of the rare mineral allanite,[4] in parallel intergrowths with epidote.—The diabase pitchstone of Sordaval, in Finland, was for a long time regarded as a mineral, to which the name sordawalite was given. This substance has lately been very carefully studied by Lœwinson-Lessing,[5] who finds it occurring as a dyke, cutting amphibole-schists. In the centre of the dyke the material is highly crystalline; at its edges it is very vitreous. Several types of the vitreous variety are characterized, as hyaline, globulitic, spherulitic and microlitic. The first-mentioned variety gives rise by alteration to several sub-varieties, among which may be mentioned the granellitic and radiolitic varieties. The former consists of a glassy type, in which certain dark particles group themselves so as to produce patches of a dark color on a background of light-colored glass, without the production of a true globulitic or spherulitic structure. In the radiolitic variety devitrification products are divergently arranged around a centre.—The nodules of the coarse granite at Ghistorrai, Sardinia, are described by Fouqué[6] as composed of a centre of orthoclase, oligoclase, biotite and muscovite, around which is a zone consisting of triclinic soda-feldspar and biotite, arranged in concentric layers. The biotite of the nodule is older than the feldspar and remains quite fresh, while the same mineral in the body of the rock is much altered.

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[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Me.

[2] Johns Hopkins Univ. Circ., No. 65, April, 1888, p. 68.

[3] Cf. Amer. Naturalist, 1886, p. 1049.

[4] Cf. Amer. Naturalist.

[5] Min. u. Petrog. Mitth., 1887, ix., p. 61.

[6] Bull. d. l. Soc. Franç d. Min., x., p. 57.

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NEW MINERALS.—*Caracolite* from Caracoles, Chili, has lately been described by Sandberger[1] as a new mineral. It is intimately associated with percylite, and like this latter is regarded as derived from galena by alteration. Caracolite occurs in transparent crystals with a hexagonal habit; produced by trillings of rhombic individuals according to the aragonite law. The axial ratio is: $a : b : c = .5843 : 1 : .4213$. Its specific gravity is 5.1. Its analysis yielded results corresponding to the formula $Pb (OH) Cl + Na_2 SO_4$. The associated *percylite* was also analyzed and found to correspond to $Pb (OH) Cl + Cu (OH) Cl$.—*Mursinskite*[2] has been found only in two small yellow translucent crystals at the topaz locality at Mursinsk, near Alabaschka, in the province of Ekaterinoslaw, Russia. The crystals are tetragonal with an axial ratio, $a : c = 1 : 0.5664$. They are bounded by $P, 2P\infty, \frac{5}{3} P\infty$, and various ditetragonal pyramids. Their composition is unknown. —*Bementite* is a radially fibrous mineral not unlike pyrophyllite in appearance, which occurs at Franklin, N. J. Its color is grayish yellow, and its specific gravity 2.981. Its composition as described by Prof. König[3] is:—

$Si O_2$	$Mn O$	$Fe O$	$Zn O$	$Mg O$	$H_2 O$
39.00	42.12	3.75	2.86	3.83	8.44.

corresponding very nearly to $(H_2 Mn)_2 Si O_4$.—*Martinite* is a new calcium phosphate from the Island Curaçoa, in the West Indies. It occurs, according to Kloos,[4] only in pseudomorphs after gypsum. Under the microscope it is seen to consist of an aggregate of little rhombohedra. Its specific gravity is 2.892 to 2.896. Its analysis yielded:—

$P_2 O_5$	$Ca O$	$H_2 O$	Org. subs.	Insol.
47.77	47.20	4.52	.75	.20

—*Arseniopleite* is a reddish brown substance associated with rhodonite and hausmannite in veins in a crystalline limestone at the Sjö mine, Gryhyttan, Province of Oerebro, Sweden. Its analysis yielded Igelström[5]:—

$As_2 O_5$	$Mn O$	$Fe_2 O_3$	$Pb O$	$Ca O$	$Mg O$	$H_2 O$
44.98	28.25	3.68	4.48	8.11	3.10	5.67

—*Barysilite*[6] is a lead silicate ($3Pb O. 2Si O_2$) from the Harstig iron mine at Pajsberg, Sweden. Its color is white, crystallization hexagonal, hardness about 3, and its specific gravity 6.11 to 6.55.—*Calciothorite*, *Melanocerite* and *Rosenbuschite* are silicates of the rare

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Neues Jahrb. f. Min., etc., 1887, ii., p. 75, and Websky: Sitzb. Ak. Wissensch Berlin, Nov., 1886.

[2] Kokscharow: Bull. d. l'Acad. Imp. des Sciences d. St. Petersb., 1887, p. 450.

[3] Proc. Acad. Nat. Sc. Phila., Oct., 1887, p. 311.

[4] Sammlg. d. Geol. Reichsmus. Leiden. Ser. ii., Bd. i. Ref. Neues Jahrb. f. Min., etc., 1888, i., p. 41.

[5] Bull. Soc. Min., 1888, xi., p. 39.

[6] Sjögren and Lundström: Oefv. Vet. Ak. Förh., 1888, xlv., p. 7.

metals. They are found in the elæolite-syenite veins of Norway.[1] —*Cliftonite.* With reference to certain little cubical crystals of graphite (?) found in pieces of an iron meteorite from Youndequi, Australia, Fletcher[2] states that Haidinger as early as 1846 described crystals of graphite, which he regarded as pseudomorphs after pyrite. Since pyrite does not occur in meteorites, and since, moreover, these little graphite pieces are entirely surrounded by metallic iron, Fletcher thinks that their shape must be original, and that this substance is truly regular in crystallization.

CRYSTALLOGRAPHIC NEWS.—It has been known for a long time past that the natural conclusions to be drawn from the Bravais-Mallard theory of cleavage planes and crystal structure, based upon the point system of explaining crystallization, have not been borne out by the facts. As a consequence of this theory it is demanded that the planes of easiest cleavage in a mineral should be parallel to those planes which are most commonly present on it and best developed. This is known, however, not to be the case. Sohncke[3] explains how these difficulties can be met by modifying the theory of the point system, as pointed out by him in recent[4] papers.—The same subject is further discussed by Wulff,[5] who takes up the different crystallographic systems in detail, describes in terms of the theory the inner structure of minerals crystallizing in each, and pictures the development of holohedral, hemihedral and hemimorphic forms. Three lithographic tables, with one hundred figures, illustrate the paper.—Brugnatelli[6] has subjected the *datholite* occurring in the contact between serpentine and gabbro at the Serra dei Zanchetti, in the Bolognese Appenines in Italy, to a complete examination, both crystallographic and optical. He finds forty-one forms on the crystals examined, among them the new forms $\frac{4}{3}\,P\overline{\infty}$, $2\,P\bar{2}$,$-5\,P\bar{5}$,$-\frac{3}{2}\,P\bar{3}$–,$\frac{5}{2}\,P\,\bar{5}$ and3 $P\overline{\tfrac{3}{2}}$ ($a : b : c = 1.2657 : 1 : .6354$ $\beta = 89° \, 51'$). The optical angled measured in oil is 74° 21′ for sodium light, and the first bisectrix is inclined 51′ to the *c* axis, in the acute angle β. An analysis of the mineral gave $SiO_2 = 37.89$, $CaO = 35.04$, $B_2O_3 = 21.23$, $H_2O = 5.84$.—*Cinnabar* crystals from Mt. Avala, near Belgrade in Servia. have been carefully measured by A. Schmidt.[7] He finds on them trapezohedral forms so largely developed as to determine their habit. To the forty-eight forms already described as occurring on the mineral, Schmidt adds ten new ones, viz.: $\frac{1}{2}\,P2$, $\frac{2}{3}\,P2$, $\frac{6}{13}\,P\frac{6}{5}$, $\frac{2}{5}\,P\frac{4}{3}$, $2\,P\frac{4}{3}$, $2\,P\frac{5}{4}$, $\frac{3}{7}\,P\frac{3}{2}$, $\frac{8}{5}\,P\frac{8}{5}$, $\frac{10}{23}\,P\frac{5}{3}$ and $\frac{5}{6}\,P\frac{5}{3}$.—The negative deltoid dodecahedron$-\frac{3\,O}{2}$

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[1] Brögger: Geol. Fören. Föhr., 1887, ix., p. 247.

[2] Miner. Magazine, July, 1887; and Zeits. f. Kryst., xiii., 1887, p. 383.

[3] Zeitsc. f. Kryst., xiii., 1887, p. 209.

[4] Wiedem. Annalen, 1882, 16, p. 499.

[5] Zeits. f. Kryst., xiii., 1888, p. 503.

[6] Zeits. f. Kryst., xiii., 1887, p. 150.

[7] Zeits. f. Kryst., xiii., 1888, p. 433.

has been detected by Hintze[1] on a crystal of sphalerite from Striegau.

MISCELLANEOUS.—As the result of a series of experiments upon the strongly pleochroic epidote of Sulzbachthal, Ramsay[2] finds that the absorption colors of this mineral are not symmetrically arranged around the axes of elasticity vi and c lying in the plane of symmetry. Moreover, he finds that the absorption axes—the directions in which the greatest, the least and the mean absorption takes place—do not correspond with the axes of greatest, least and mean elasticity, as had already been indicated by earlier observations. The direction of greatest absorption for the red ray in the clinopinacoid is inclined 28° to the axis of least elasticity, while the direction of absorption of the green ray is inclined 35°. After examining a large number of thin plates prepared from epidote and other monoclinic minerals, and one triclinic mineral, Ramsay concludes (1) that one of the absorption axes in monoclinic crystals coincides with the axis of symmetry b, while the other two lying in the plane of symmetry do not necessarily coincide with the axes of elasticity for the same color. In triclinic minerals there is no accordance between the absorption axes and the axes of elasticity. (2) The axes of greatest and of least absorption for any given color in triclinic minerals and the absorption axes lying in the plane of symmetry of monoclinic minerals are not always perpendicular to each other, as are the axes of elasticity.—The same subject is discussed mathematically by Drude,[3] who calculates the positions of absorption maxima in monoclinic and triclinic minerals from data obtained by Ramsay. He finds slight discordances between the observations of Ramsay and the theoretical demands, but concludes that, on the whole, Voight's[4] theory of absorption is substantiated.—By supplying a blast lamp with warm air and with oxygen, Specia[5] has succeeded in fusing many of the minerals infusible under ordinary conditions. The differences in their conduct under these changed conditions may serve to distinguish between minerals having the same general appearance; *e.g.*, quartz is infusible even when the blast lamp is supplied with warm air, while it is easily fusible to a colorless glass when oxygen is used. Colorless topaz is difficultly fusible in the first case, while it fuses readily with intumescence in the second case. Colorless zircon is infusible in both cases, but becomes cloudy at the high temperature produced by the combustion with oxygen.

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[1] Zeits. f. Kryst., xiii., 1887, p. 161.

[2] Zeits. f. Krystallographie, 1887, xiii., p. 98.

[3] Zeits. f. Krystallographie, 1888, xiii., p. 567.

[4] Wiedem. Annalen., 1884, 23, p. 577.

[5] Atti. d. R. Accad. d. Scienze di Torino, xxii., p. 1887. Ref. N. J. B., 1888, i., p. 177.

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MINERALOGY AND PETROGRAPHY.[1]

(From the AMERICAN NATURALIST, August, 1888.)

PETROGRAPHICAL NEWS.—The sanidinite bombs from San Miguel, one of the Azores group of islands, are regarded by Pau~~l~~[2] as z/ the first products of the crystallization of the magmas from which the existing phonolitic and trachytic rocks resulted, and not ae altered pieces of some foreign rock caught up by the magma in its passage to the surface of the earth. They are coarsely crystalline aggregates of sanidine, augite, with which are associated other less common minerals, as pyrrhite, azorite and lavenite. The sanidins is intergrown with albeite lamellæ having the position of the dome $13 P\bar{\infty}$. The hornblende is similar to arfredsonite in composition, and has an extinction of about 34° in plates parallel to the clinopinacoid. The lavenite has all the properties of this mineral as described by other writers.[3] Its extinction on the clinopinacoid is 21°. The little hyacinth-red octahedra of *pyrrhite*, which were regarded by Hubbard as probably belonging to a titanate, were isolated and found to be crystals of a niobate related to pyrochlor or koppite. The *azorite* was analyzed, yielding: $ZrO_2 = 66.3\%$; $SiO_2 = 35.3\%$—very nearly the composition of zircon.—In a brief synopsis of a paper now in course of publication in the *American Geologist*, Mr. Haworth[4] communicates some interesting notes on the Archæan rocks of Missouri. In a diabase porphyrite, from Madison county, are areas of quartz, which seem to be the remains of porphyritic crystals, whose original outlines have been destroyed by the corroding action of the diabase magma before its consolidation. Since an analysis of the rock reveals a content of only 53.4% of silica, it would seem that we have another[5] instance illustrating the possibility of the separation of free silica from a very basic magma. In another porphyrite the rare rock constituent piedmontite was detected. A very instructive fact in connection with the Missouri rocks is the existence of granites of idiomorphic orthoclase crystals which have been enlarged by the addition of orthoclase material. In some cases this enlargement is in the shape of a granophyre border, and in others of a solid vein of irregular outline surrounding a well-marked idiomorphic crystal.—In the course of an examination of a minette from Weiler, near Weiselburg, Alsace, Linck[6] found the porphyritic crystals of biotite to be surrounded

[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Me.
[2] Neues Jahrb. f. Minn., 1888, i., p. 117.
[3] Amer. Naturalist, 1887, p. 850.
[4] Johns Hopkins Univ. Circulars, No. 65, April, 1888.
[5] American Naturalist, 1887, p. 372.
[6] Mitth. d. Comm. f. d. Geol. Landesuntere, von Elsass-Lothringen, 1887, i., p. 69.

by the dark zones so characteristic of the mineral in rocks of this class; when treated with hydrochloric acid, the dark color of the external rim was destroyed, leaving an isotropic substance, which the author supposes to be amorphous silica. He explains the origin of the ~~zinc~~ zone by supposing the biotite to have been acted upon by the remainder of the liquid magma, from which it had separated, and thus to have lost a portion of its alkaline and alkaline-earth constituents, which helped to form the feldspar, forming with small plates of biotite the entire groundmass of the rock. The iron left by this decomposition separated out as magnetite in the dark ~~zinc~~ zone.—In a late number of the *American Journal of Science* Mr. Kemp[1] describes a dyke of camptonite cutting the rocks in the Forest of Dean magnetite mine in Orange county, N. Y. The rock differs from the typical[2] camptonite in containing a larger proportion of feldspar and smaller crystals of hornblende. The feldspar is an oligoclase with the composition:—

SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	K_2O	Na_2	Loss.
48.19	16.79	18.37	6.85	1.32	1.11	5.59	2.31

—While engaged in studying a peridotite from Little Deer Isle, in Maine, Mr. Merrill[3] noticed the enlargement of its augitic constituents by the growth around it of a secondary augite with the same optical orientation, but a different color.

MINERALOGICAL NEWS.—In a very interesting paper on the chemical constitution of the different colored *micas* occurring in a pegmatite at Schüttenhofen, Bohemia, Scharizer[4] records the analyses of several members of the mica group of minerals, and draws some general conclusions in regard to them. The pegmatite is surrounded on all sides by limestone. Its constituents are arranged in three zones, in the first of which *lepidomelane* and white and brown *muscovite* occur. In the second a yellowish white muscovite, and in the third *lithium micas*. Analyses of these are given as follows:—

	Lepidomelane.	Brown Mus.	Yell.-white Mus.	Lithium-mica.[5]
SiO_2	35.31	43.67	44.08	49.26
TiO_2	1.20			
n S~~i~~O_2	.16			.06
Al_2O_3	22.62	36.69	36.83	25.27
Fe_2O_3	5.68	2.10	.48	
FeO	18.04	.55	.74	.84
MnO	1.19	tr	.25	.85
MgO	3.69			
CaO			1.99	

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[1] Amer. Jour. Sci., April, 1888, p. 331.
[2] Ib., III, xvii, p. 147.
[3] Ib., June, 1888, p. 488.
[4] Zeits. f. Krystallographie, 1888, xiii., p. 449.
[5] Cf. Am. Jour. Sci., xxxii., p. 353.

K_2O	8.61		11.10	
$(K.Rb.Cs)_2O$		8.57		13.85
Na_2O	.62	1.95	.21	.35
Li_2O	.30	tr	.37	5.38
H_2O	1.21	4.35	4.98	1.76
Aq	2.30	1.15	1.17	
Fe	.60	.35	.19	5.68

In the discussion which closes the paper Scharizer concludes that all lepidolites are isomorphous mixtures of the pure muscovite molecule with the molecule $(HO.F)_6.\ R^1_8\ Al_6\ Si_{10}\ O_{30}$.—A suite of specimens representing the rarer copper minerals of the Mammoth Mine region in Utah, having come into the possession of Messrs. Hillebrand and Washington,[1] an investigation of their physical and chemical properties was undertaken to determine their true nature. Measurements of the interfacial angles of *olivenite* from the American Eagle mine yielded as the axial ratio for this mineral .9396 : 1 : .6726. It was impossible to determine whether the mineral is orthorhombic or not in consequence of the poor reflections from the $_\infty P_{\overline{\infty}}$ faces. Olivenite from the Mammoth Mine is well crystallized, with a tabular or prismatic habit. The planes most prominent on it are $_\infty P_{\overline{\infty}}$, $_\infty P$, $P_{\breve{\infty}}$, $_\infty P_{\breve{\infty}}$ and $P_{\overline{\infty}}$. Its pleochroism is olive-green parallel to *c*, and brownish yellow parallel to *b*. On small hexagonal crystals of *chalcophyllite* the two new planes $-\frac{1}{3}R$ and $-\frac{1}{6}R$ were noticed. These crystals are tabular in habit, with OP largely developed, and are grouped into little rosettes. *Clinoclasite* occurs both in crystals and in globular and barrel-shaped forms, due to the grouping of crystals in a position varying slightly from parallelism. On the crystals, which are usually elongated in the direction of the *b* axis, the two new forms P and $\frac{1}{3}P$ were detected. Analyses indicate the correctness of the formula usually ascribed to this mineral, viz.: $Cu_3\ (AsO_4)_2 + 3Cu\ (OH)_2$. Two types of *brochautite* (hydrous sulphate of copper) were also examined. Crystals of the first type are dark green, and are prismatic in habit. Those of the second type are of a light green color, and have a curved double-wedge shape, produced by the occurrence of $3\ P_{\overline{12}}$ and $_\infty P_{\breve{\infty}}$ faces. A mineral with the general appearance of *tyrolite* yielded Mr. Hillebrand:—

CuO	ZnO	CaO	MgO	As_2O_5	P_2O_5	H_2O	SO_3
46.38	tr	6.69	.04	26.22	tr	17.57	2.27,

a result indicating a composition corresponding to $5CuO.\ As_2O_5.\ 7\frac{1}{2}H_2O$, instead of to the generally accepted formula, $5CuO.\ As_2O_5.\ 9H_2O$. The mineral forming delicate tufts of silky needles of a light color, supposed by Mr. Pearce[1] to be a new mineral, has been found upon closer examination to have the composition of *Mixite* $(Cu_{20}\ Bi_2\ As_{10}\ H_{44}\ O_{70})$, but different physical properties. It is uniaxial or orthorhombic, and its specific gravity is 3.79.—According to Prof. Chester,[1] the *marcelite* from Cumberland, R. I., and the photicite and klipsteinite from Jackson county, N. C., are nothing more than mixtures of rhodonite and its decomposition products, a conclusion to which Prof. Bauer,[2] of Marburg, assents.—Native 3/7 *platinum* and *cinnabar* are reported[3] as occurring in British Columbia. The former has been found in the bed of a branch of the north fork of Similkameen River. It is in the form of rounded grains and pellets. It has the composition :—

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[1] Amer. Jour. Sci., xxxv., April, 1888.

Pt	Pd	Rh	Ir	Cu	Fe	Os Ir	Gaugue.
72.07	.19	2.57	1.14	3.39	8.59	10.51	1.69

3/7 The rare minerals[3] *uranite*, *gummite* and *uraconite* have also been found in Canada, at the Villeneuve mica mine, Ottawa county, Province of Quebec.—*Xanthitane*, from Green river, Henderson county, N. C., is an alteration product of sphene. It is apparently a clay with the silica replaced by titanium. The air-dried substance loses 6.02 per cent. of water at 100°. The composition of the dried material is :—

SiO_2	TiO_2	Al_2O_3	Fe_2O_3	CaO	P_2O_5	H_2O
1.76	61.54	17.59	4.46	.90	4.17	9.92

—Bement[5] mentions the occurrence of fine crystals of *wulfenite* at the Red Cloud mine in Arizona, and beautiful *azurite* and *malachite* at Bisbee, in the same State.—Knop[6] declares the olivine from the limestone of Schelinger, in the Kaiserstuhl, to be *forsterite*, with the composition : —

SiO_2	MgO	FeO	MuO	Al_2O_3
41.88	49.83	4.56	1.73	trace

CRYSTALLOGRAPHIC NEWS.—In a very interesting paper recently published, L. Wulff[7] shows that each of the three possible kinds of tetartohedrism probably occurs on crystals of the regular system. The forms derived by the three different kinds of selection can, however, not be distinguished from each other and from some of the hemihedral forms in the same system, except by a combination of morphological and physical observations. By these methods Wulff is lead to conclude that the bromate and chlorate of sodium crystallize in the gyroidal-tetrahedral division, and that the nitrates of barium, strontium and lead crystallize in the pentagonal-tetrahedral division of the regular system. Analogous results[1] follow from a discussion of the possible kinds of letartohedrism in the other systems.—Scharizer[2] describes honey-yellow to greenish *xenomite* crystals from a pegmatite vein near Schüttenhofen, Bohemia. The most prominent type is that produced by the combination of the prisms and pyramid with the ditetragonal pyramid, though ricinal planes obscure to some extent the tetragonal symmetry of the mineral. The axial relation is 1 : .62596. In a second type the prismatic faces are wanting.—Wine-yellow crystals of *barite* from the phenolite of Oberschaffhausen, in the Kaiserstuhl, have been examined by Beckenkamp.[3] Three types are recognized. The first is characterized the large development of the prismatic and basal planes, while the second type contains in addition the brachydomes. The third type contains the latter faces developed to the almost complete exclusion of the prismatic faces. The axial ratio of the crystals is .8151 : 1 : 1.3019. They are pleochroic in yellow and white tints.—Cathrein[4] has found in the *adularia* from Schwarzenstein, Zillerthal the prismatic faces $\infty P\overline{\tfrac{3}{5}}$, $\infty P\overline{\tfrac{8}{5}}$ and $\infty P\overline{\tfrac{7}{5}}$, the orthodomes $\tfrac{8}{7}P\overline{\infty}$ and $-280P\overline{\infty}$, and the orthopyramid $\tfrac{21}{20}P\overline{9}$, all of which are new to orthoclase.—Crystals of *chalcopyrite*[5] from Holzheim, in Nassau, are interesting in that they contain the scalenohedron modified only by the very small planes $\frac{P}{2}$ and $2P\infty$.

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[1] Neues Jahrb. f. Min., etc. 1888. I., p. 187.

[2] Ib., p. 214

[3] Ann. Rep. Geol. and Nat. Hist. Surv. of Canada in 1886. T. p. 5. Ib. p. 10.

[4] Eakins. Am. J. Science, May, 1888, p. 418.

[5] Zeits. f. Kryst., xiii., 1887, p. 46.

[6] Ib., xiii., 1887, p. 236.

[7] Zeits. f. Kryst., xiii., 1887, p. 273.

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[1] Ib., xiii., 1888, p. 474.

[2] Ib., xiii., 1887, p. 15.

[3] Zeitschrift, f. Kryst., xiii., 1887, p. 25 and p. 386.

[4] Ib., xiii., 1887, p. 332.

[5] H. Mayer. Ib., xiii., 1887, p. 47.

MINERALOGY AND PETROGRAPHY.[1]

(From the American Naturalist, September, 1888.)

Petrographical News.—In a late number of the *American Geologist*,[2] Messrs. Herrick, Clarke and Deming have a short article on some American norites and gabbros. Three rocks are described. The first is from Marshall Co., N. C., and is called olivine-norite. Its feldspathic constituent is labradorite, and its pyroxene is regarded as bronzite. The second—a porphyritic diorite, contains garnet and apatite. It is a facies of the norite. The Duluth gabbros are finally taken up and briefly described. In one phase of this rock the authors think they have found feldspar crystals, with a central core of labradorite, surrounded by a zone of orthoclase. Very little new is stated in regard to these rocks, except the view that the orthoclase-gabbros may be derived by the action of solutions (emanating from acid rocks) upon olivine-gabbro. The paper contains the statements of many important views, which, however, will not generally be accepted by petrographers unless substantiated by many more facts than the authors have been able to discover.—An instructive paper on some English tachylites is that by Mr. Cole in the *Quarterly Journal of the Geological Society*.[3] In it he describes a glassy basalt which exhibits all the stages in the transition from a glassy to the completely spherulitic forms so familiar among acid lavas. The spherulites are sometimes composed of an intergrowth of gray and brown fibres, which show the strongest absorption in reversed position, the brown fibres becoming darker when their long axes are parallel to the short axes of the nicols, and the gray fibres when their transverse axes are parallel to this direction. As the result of his observations, Cole is inclined to regard variolite as a perlitic tachylite, whose perlitic cracks have been filled with secondary minerals.—Chelius[1] divides the dyke rocks cutting the eastern and the western areas of crystalline schists in Spessart and Odenwald as granite-porphyries and minettes in the latter area, and kersantites in the former. The kersantites are panidiomorphic aggregates of plagioclase and augite, together with hornblende, mica, quartz, apatite and a few rare minerals. The panidiomorphic structure passes into the holocrystalline porphyritic toward the edges of the dykes. The minettes of the Odenwald fall into two groups, the minettes proper, and the vogesites or minettes poor in mica. The latter embrace both augitic and hornblendic varieties. The minettes sometimes contain augite and sometimes biotite as their principal ingredient. The granite porphyries possess no peculiarity of structure or composition to which attention need be called.—The article on the Archæan Geology of Missouri, to a preliminary notice of which attention was directed in these pages a short time ago, has lately made its appearance.[2] In addition to the interesting observations already noted, it may be remarked that Mr. Haworth finds the nature of the plagioclase in the porphyrites from this region to be in no way connected with the presence or absence of quartz in the rocks. A more basic feldspar is so metimes found in a porphyrite containing free quartz, than in one in which no quartz is visible. The ground mass of a certain class of the porphyries resembles in structure the appearance known as pœcilitic. This is due to the inclusion of small particles of feldspar in quartz.—The elæolite-syenite[3] from the middle Transvaal, South Africa, consists of apatite, sphene, augite, hornblende, nepheline, feldspar, sodalite and zeolites in the order of their age. The porphyritic feldspar, probably anorthite, contains inclusions of all the older constituents. The augite occurs in two generations. The larger crystals have the optical properties of common augite, and contain a small percentage of alkalies. The mineral of the second generation is grouped into little bundles, and has the properties of acmite. It contains both alkalies and manganese. The nepheline is for the most part fresh; but in some cases has undergone alteration into zeolites.—A typical chlorite-schist has been discovered by Cathrein[4] at Gerlos, in the Tyrol. In a muscovite-quartz background are porphyritic chlorite crystals with all the characteristics of chloritoid. Graphite, ankerite, zircon, tourmaline and rutile are the prominent accessory constituents. The rutile occurs as needles penetrating all the other minerals.—In an article on the bituminous rocks of Nullaberg, in Sweden, Törnebohm[1] gives the results of his examination of the bituminous matter existing in the archæan schists of that region. The locality has been known for some time, and is quite noted as having afforded data for arguments in favor of the existence of life in the globe during archæan time. The rock in which the organic matter occurs is a schist composed of microcline, chlorite, a little garnet and other accessory components. It is interstratified with gneiss, and is about fifteen metres in thickness. A part of the organic matter is in little lumps and irregularly shaped pieces, which are thought by the author to be original. It is sometimes entirely surrounded by microcline. Other bituminous substances fill cracks and cavities, which were probably produced in the rock by dynamic forces. This is younger in age than the rock itself, and was probably produced by the saturation of shattered rock by liquid hydrocarbons, which afterwards dried out, leaving a deposit of asphaltum.

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[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Maine.
[2] June, 1888, p. 339.
[3] May, 1888, p. 300.

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[1] Neues Jahrb. f. Min., etc., 1888, ii., p. 67.

[2] Inaug. Disser., Johns Hopkins Univ., 1888, and Amer. Geologist, May and June, 1888.

[3] E. A. Wülfing. Neues Jahrb. f. Miner., 1888, ii., p. 16.

[4] Verh. d. k. k. Geol. Reichsanst.

MISCELLANEOUS.—In connection with the article of Törnebohm, referred to above, it may be of interest to call attention to a recent article by Engler,[2] on the origin of petroleum. The experimental work of this chemist substantially re-enforces the theory which supposes petroleum to be the result of the distillation of the remains of marine animals at a low temperature and under pressure. Engler has obtained a series of oils, very similar in composition to the most prominent hydrocarbons of petroleum, by the destructive distillation of menhaden under a pressure of ten atmospheres, and at a temperature of 320°–400°.

[1] Neues Jahrb. f. Min., etc., 1888, ii., p. 1.

[2] Ber. d. d. Chem. Gesell., 1888, p. 1816.

MINERALOGY AND PETROGRAPHY.[1]

(From the AMERICAN NATURALIST, October, 1888.)

PETROGRAPHICAL NEWS.—The basaltic rocks of Alsace, according to Linck,[2] embrace feldspathic and non-feldspathic varieties. Of the latter a limburgite from Reichenweiler contains a glassy base, which deports itself towards reagents like nepheline, a fact which would cause the rock strictly to be classed among the nepheline basalts. Its olivine yields upon analysis:—

SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	Na_2O
41.53	2.33	0.58	10.27	43.60	1.69,

indicating a replacement of part of the magnesium of the typical molecule by aluminium and sodium. Olivine concretions occurring in this rock consist of olivine, bronzite and a bottle-green augite containing 2.64 per cent. of K_2O and 2.41 per cent. of Na_2O.—Brief notes on the rocks of Fernando Noronha, an island in the Atlantic about two hundred miles north-east of Cape St. Roque, Brazil, are communicated from the laboratory of the Johns Hopkins University by Mr. Gill.[3] The rocks described are phonolites, from conical hills similar to those in the Hegau in Baden, nepheline-basanites and basalts, nephelinite, and finally basalt glass. An extended petrographical study of these in all their different varieties will be published later.—Although the rocks of the Bohemian Mittelgebirge have been made the subjects of study by several petrographers, Hibsch[4] finds something new to say of them in a late article in *Tschermak's Mittheilungen*. The trachytes of the region are younger than the phonolites or the basalts and occur in but a few localities. Their porphyritic sanidines possess a rounded outline and are fringed with a rim of newly formed secondary feldspathic substance. Many of the phonolites contain a large amount of plagioclase, and have besides a trachytic habit. In their cavities is often noticed quite an interesting development of secondary albite. Little crystals of this mineral extend out from the sides of the cavity and penetrate into a mass of analcite, which, together with chabasite, has resulted from the alteration of the plagioclase. —In Blum's "Pseudomorphosen"[1] mention is made of a granite at Vordorf in the Fichtelgebirge, in which the flesh-red orthoclase is partially altered into epidote. Sandberger,[2] who has found blocks of the same rock, states that the epidote is more likely an alteration product of hornblende or augite, as it is associated with asbestus, while the red orthoclase is still fresh.—A grammatite rock occurs,[3] interstratified with phyllite, in the Bohemian Fichtelgebirge, between Klein-Wenden and Sichersreuth.—The third paper on the rocks of the Cortlandt Series, in the Hudson river, embraces[4] the treatment of the gabbros and diorites associated with the peridotites and norites which have been described in another place.[5] The gabbros present no peculiar features other than the granulation of some of their constituents. Two types of diorite are distinguished. One, containing brown hornblende, tends to pass into gabbro, norite, or hornblendite. The other, containing green hornlende, is closely related to mica-bearing rocks. The mica-diorites (Dana's soda-granites) are essentially coarse-grained aggregates of plagioclase and biotite, with often a little orthoclase and quartz, and sometimes garnet as a metamorphic mineral. The plagioclase has a specific gravity between 2.67 and 2.65, and is sometimes twinned, while at other times it is entirely free from twinning lamellæ. The most noticeable feature in the rock is the occurrence in it of a pale green non-pleochroic epidote, which appears to be original. The mineral is generally without terminations. It is strongly corroded on its edges as if eaten into by a liquid magma. The paper closes with a graphic representation of the close relations, which the author, Dr. Williams, has found to exist between the various eruptive members of this series.

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[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Me.

[2] Mitth. d. Comm. f. d. Geol. Landesunters, von Elo.-Lothr., 1887, i., p. 49.

[3] Johns Hopkins Univ. Circulars, No. 65, April, 1888, p. 71.

[4] Min. u. Petrog. Mitth., 1887, p. 232.

MINERALOGICAL NEWS.—In Douglas Co., Oregon, is a bed of *nickel silicate*, resembling garnierite, whose origin has been determined with some degree of certainty by Prof. Clarke.[6] A pure specimen of the mineral was found to have the composition:—

TiO	MgO	SiO_2	$Al_2O_3+Fe_2O_3$	Loss on ign.	Loss at 110°
27.57	10.56	44.73	1.18	6.99	8.87

The country rock associated with this mineral is a peridotite whose olivine contains .26 per cent. of nickel oxide. This rock was examined by Mr. Dieles, and was found to be penetrated by cracks filled with serpentine and quartz. The nickel mineral, wherever it occurs,is always associated with these alteration products. It occurs in the serpentine, which is directly connected with the grains of olivine from which it has been derived. There is every reason to believe that the nickel silicate came from the same source. A study of the Webster Co., N. C., and the New Caledonia nickel deposits indicate the same origin for the ores at these places.—A feldspar from Kilima-njaro, similar to that from the rhombic porphyry of Christiania, has been analyzed by Fletcher.[1] Its composition is:—

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[1] iii., p. 120.

[2] Neues. Jahrb. f. Min., etc., 1888, i., p. 208.

[4] Sandberger: Neues Jahrb. f. Min., etc., 1888, ii., p. 202.

[3] Amer. Jour. Sci., June, 1888, xxxv., p. 438.

[5] Amer. Naturalist, June, 1887, p. 568.

[6] Amer. Jour. Sci., xxxv., 1888, p. 483.

SiO_2	Al_2O_3	CaO	Na_2O	K_2O
62.17	23.52	2.90	6.80	4.61,

corresponding to a mixture of the anorthite, microcline and albite molecules in the proportions An, $\text{Or}_{.94}$, $\text{Al}_{2.11}$. The extinction on the clinopinacoid is about 4° 20′. On the basal plane it is parallel to the clinopinacoid cleavage. In sections cut parallel to the orthopinacoid the microcline structure is visible.—Sandberger[2] calls attention to the properties of the carbonaceous material in the crystalline limestone of Wunsiedel in the Fichtelgebirge, as those of an amorphous substance corresponding to the graphitoid of Inostranzeff[3] and Sauer.[4] The hardness of the mineral is 3 and the specific gravity 2.207. It yields when burned 1.78 per cent. of ash.—A new analysis of *spodumene* from Brazil leads Jannasch[5] to the results reached by other analysts, and affirms the correctness of the formula $(\text{Li. Na})_2\,\text{Al}_2\,(\text{SiO}_3)_4$.—Brief notes on the six iron sulphates, *coquimbite*, *copiapite*, *quenstedtite*, *bückingite*, *stypticite* and *halotrichite*, from Chili, are communicated by Linck[6] in a letter to the *Neues Jahrbuch*.

MORPHOLOGICAL AND PHYSICAL MINERALOGY.—Since almost all of our knowledge of the morphological properties of *markasite* depend principally upon the measurements of Hausmann and Sadebeck, and since these mineralogists disagree in their results, Gehmacher[7] has thought it worth while to measure the crystals in his possession, and from these measurements to recalculate the planes occurring in them. He finds the axial ratio to be: .7623 : 1 : 1.2167. The formulas of the different planes are determined, and other observations are made which indicate a monoclinic symmetry for the mineral.—Zepharovich's[8] measurements of *trona* crystals from Lake Lagunillas, Venezuela, show their axial relation to be:

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[1] Min. Magazine, July, 1887, and Zeits. f. Kryst. xiii., '87, p. 384.
[2] Neues Jahrb. f. Min., etc., 1888, i., p. 200.
[3] Neues Jahrb. f. Miner., etc., 1880, i., p. 97.
[4] Zeits. d. d. Geol. Zeits., xxxvii., p. 441.
[5] Neues Jahrb. f. Min., etc., 1888, i., p. 196.
[6] Neues Jahrb., f. Min., etc., 1888, i., p. 213.
[7] Zeits. f. Kryst., xiii., 1887, p. 242.
[8] Ib., xiii., 1887, p. 135.

2.8459 : 1 : 2.9696. $\beta = 77° 23'$. Their composition corresponds to that of the same mineral from other localities.—Very pure *idrialite* ($C_{80}H_{36}O_2$), crystals from Idria in Krain, consist of small plates bounded on two sides by parallel planes. The extinction against one of these sides is 5° 33′, and the optical angle of the mineral, measured in oil, is $2H = 101° 20'$. The interference figure is that of a biaxial crystal, with the bisectrix perpendicular to the surfaces of the plate.—A great many observations have been made by Niedmann[1] upon *barite* in order to determine the relations between the elasticity and the other physical properties of the mineral. He finds the direction of greatest elasticity to be perpendicular to the plane of easiest cleavage. The shape of the curve representing the relative values of the coefficients of elasticity for any given plane, corresponds in all cases to the symmetry of the orthorhombic system.

MISCELLANEOUS.—In a late paper Dr. Cohen[2] discusses critically the arguments in favor of the chemical theory of deposition for gold in placers, and also those in favor of its mechanical origin. He gives the main facts bearing on the subject, and shows that some of those which have always been cited as favoring the chemical theory, are of doubtful existence. It has been stated, for instance, that placer gold always contains less silver than vein gold from the same region. Analyses of specimens from Buttons Creek, in the South African gold-fields, however, prove that this is not always the case. Dr. Cohen's results are:—

	Au	Ag	Cu	Insol.
Vein gold	94.48	5.16	.25	.02
Placer gold	91.38	6.49	.09	.78
	95.02	4.60	.11	.07

He thinks that whereas placer gold, for the most part, is derived by the breaking down of gold veins, there is occasionally in addition a deposition of the metal from its solutions. This, however, he regards as playing but a subordinate rôle in the formation of placer gold.—A meteoric stone,[3] found in the San Emigdio mountains in California, is composed of chondri of olivine and anstatite, imbedded in a base composed of the same minerals in a fragmental condition. Nickeliferous iron constitutes 6·21 per cent. of the stone. It occurs in lumps and masses, often surrounding the chondri. An analysis of the metallic portion yielded 11.27 per cent. of nickel.

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[1] Ib., xiii., 1887, p. 362.

[2] Mitth. d. naturw. Ver. f. Neuvorpom. u. Rügen, 19 Jahrg., 1887.

[3] Merrill: Am. Jour. Sci., June, 1888, p. 490.

MINERALOGY AND PETROGRAPHY.[1]

(From the AMERICAN NATURALIST, November, 1888.)

PETROGRAPHICAL NEWS.—There have recently appeared two interesting papers upon the Cortlandt series of eruptive rocks, and the changes they produce in the surrounding mica-schists and limestones. The first paper is by Mr. J. F. Kemp,[2] who reports the results of his examinations of an extension of the series west of Stony Point, N. Y. He finds the eruptives to be of the same general character as those described by Dr. Williams,[3] from near Peekskill. In one of these he notices the alteration of brown hornblende into green augite. He further finds that limestone upon the contact with these eruptives has undergone an alteration, during the course of which tremolite has been developed. Dr. Williams's[4] paper deals with the contact phenomena observed in the rocks surrounding the eruptives in the Stony Point region. The unaltered mica-schists consist of quartz, biotite, muscovite, a little feldspar, tourmaline, and occasionally zircon. Upon approaching the eruptives they lose their foliation and have developed in them: garnet, sillimanite, staurolite, scapolite, cyanite, margarite, ripidolite and corundum. The *sillimanite* is found in radiating bundles of fibres. The *ripidolite* (or clinoclor) is derived from the biotite of the schists. The *margarite* has the macroscopic appearance of muscovite. In the thin section, it is distinguished from this mineral by its high refractive index, its extinction of 6°–10°, its numerous twins parallel to oP, and its large optical angle (114½° in air). Its composition is:—

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[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Me.

[2] Amer. Jour. Sci., Oct., 1888, p. 247.

[3] Cf. Amer. Naturalist, 1886, p. 275; 1887, p. 569.

[4] Amer. Jour. Sci., Oct., 1888, p. 254.

SiO_2	Al_2O_3	FeO	CaO	MgO	H_2O
32.73	46.58	5.12	11.04	1.00	4.49

The paper contains many points of interest, and is a final, incontrovertible proof of the eruptive character of the massive rocks of the Cortlandt series.—In a paper in which the origin of quartz in basalts is discussed, Mr. Iddings[1] describes the microscopic appearance of quartz-bearing basalts from the Rio Grande cañon in New Mexico. Most of these are holocrystalline. They contain plagioclase, augite, magnetite, olivine and rounded quartzes. The quartz is usually surrounded by shells composed of little augite crystals, which extend out into the body of the rock, and are sometimes partly included within the feldspar. It has the characteristics of the porphyritic crystals of more acid volcanic rocks, and is regarded as original. The main portion of the paper is taken up with the discussion of the conditions under which the production of porphyritic quartz crystals might take place in a rock as basic as basalt. After a thorough examination into the effects which temperature, pressure, and the presence of water vapor exert upon the crystallization of a molten magma, Mr. Iddings concludes that the quartzes owe their origin to certain physical conditions attending an early period of the magma's existence; and that of these the most important is the presence of water vapor under pressure. In the same paper the writer describes two new occurrences of quartz basalt. The first is a red compact rock from the vicinity of Santa Maria Basin, in Arizona. The second is a dark-colored, fine-grained rock from the S. E. base of Anita Peak, Colorado.—Kroustchoff[2] has recently described an inclusion in the basalt from Wingendorf, in Silesia, which differs from most basalt inclusions in that it contains anorthite. This mineral and enstatite make up the larger part of the inclusion, which contains in addition to these, augite, diallage, olivine and various spinels. The *enstatite* was separated and analyzed:—

SiO_2	Al_2O_3	FeO	MgO	CaO	Alkalies	Loss
56.96	.79	3.11	33.65	4.32	tr.	.26

—A coarse-grained pyroxene-syenite,[3] from near Gröbe, in Saxony, is composed of orthoclase, plagioclase, augite and biotite, with some quartz and hypersthene. The orthoclase occurs in porphyritic crystals, while the plagioclase is found only in the ground mass. In finer grained streaks throughout the rock the augite has all been replaced by hornblende.—In an article on Mount Lupara, a crater in the Flagraian Fields, near Naples, Deecke[4] describes augite-trachyte and augite-trachyte glasses, which present no features different from those observed in the lavas of other craters in this region.—Mr. E. O. Hovey[1] reports the discovery of a cordierite gneiss at Guilford, sixteen miles east of New Haven, Conn. The cordierite has a deep blue color in the hand specimen, but under the microscope is colorless and very fresh. It contains as inclusions only sillimanite needles.—Lacroix and Baret[2] mention a pyroxenite from near Saint Nazaire, Loire-Inférieure, France, that is composed essentially of a granular mixture of augite, scapolite and sphene.—The microscopical examination and the determination of some of the physical constants of several sandstones, a marble and a tufa from California, have been made by Prof. A. W. Jackson,[3] of the University of California.

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[1] Amer. Jour. Sci., Sept., 1888, p. 208.

[2] Min. u. Petrog. Mitth., x., 1887, p. 329.

[3] Klemm: Zeits. d. deutsch. geol. Gesell., xl., 1888, p. 184.

[4] Ib., xl., p. 166.

NEW MINERALS—HOHMANNITE AND AMARANTITE.—In a mass of copiapite from near Caracoles, in Chili, Frenzel[4] has discovered two new iron sulphates. One has been called *hohmannite* after its discoverer. This is an opaque chestnut-brown fibrous mineral, with a vitreous lustre. Its hardness is 3; specific gravity, 2.24, and its streak a yellow ochre color. Its composition may be represented by $Fe(FeO)(SO_4)_2 + 7H_2O$. It is insoluble in water, readily undergoes alteration, and loses 7.63 per cent. of water when placed in a dessicator over calcium chloride. The second mineral, *amarantite*, is probably identical with the first, although the author prefers to designate it by a separate name because of its different physical and chemical properties. Amarantite occurs in orange-colored microscopic crystals of the triclinic system.[5] They have a citron-yellow streak, and a specific gravity of 2.11, and do not as readily undergo decomposition as does hohmannite.—*Riebeckite.* In a flesh-red granite from the Island of Socotro, in the Indian Ocean, a hundred and fifty miles from Cape Gardafui, Sauer[6] has found a hornblende which corresponds exactly to aegerine among the augites. Its negative bisectrix (instead of positive as in the other hornblendes) is inclined 5° to the vertical axis, its pleochroism is vr = dark blue; t = green; pi = blue, and its composition:—

SiO_2	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O
50.01	28.30	9.87	.63	.34	1.32	8.79	.72

Sauer calls attention to the fact, so often overlooked, that the formula of *arfvedsonite*, which is usually regarded as equivalent to aegerine, is based upon an analysis which is really that of aegerine

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[1] Amer. Jour. Sci., July, 1888, p. 57.
[2] Bul. Soc. Franç. d. Min. x., p. 288.
[3] Seventh Ann. Rep. State Mineralogist, Sacramento, 1888, p. 205.
[4] Min. u. Petrog. Mitth., ix., 1888, pp. 397, 423.
[5] Wülfing: ib., p. 401.
[6] Zeits. d. deutsch. geol. Gesell., 1888, xl., p. 138.

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itself.—*Beryllonite.* In a preliminary note Prof. E. S. Dana[1] suggests the name *beryllonite* for a mineral with the composition $Na Be Po_4$, occurring in orthorhombic crystals with a tabular habit, a hardness of 5.5–6, and a specific gravity 2.84. The mineral is colorless or white, and has several perfect cleavages. A full description of its characteristics, as well as of its occurrences, is promised in the near future.—*Edisonite*—a fourth form of titanic oxide (a fifth form if Mr. Diller's[2] mineral is found to consist of TiO_2)—is described by Mr. Hidden[3] from the concentrates of placer washings in Polk county, N. C., and at Pilot Mountain, Burke county, in the same State. It crystallizes in the orthorhombic system like *brookite*, but its axial ratio, as calculated by Des Cloizeaux, is .99275 : 1 : .92337. The color of the mineral is yellow or brown, its hardness about 6, specific gravity 4.285, and streak yellowish white.

RARE MINERALS.—*Bertrandite.* Heretofore this mineral has been found only in small crystals at various localities in Europe, and its crystallographic characteristics have not been thoroughly investigated. A new find at Mt. Antero, Colorado, affords Mr. Penfield[4] a crystal of sufficient size to admit of exact measurements of the crystallographic constants. According to Mr. Penfield, the mineral is orthorhombic with $a : b : c = .5723 : 1 : .5953$, and $2H = 101° 10'$ for yellow light. The hemimorphic development of the basal plane cannot be explained. The crystals are attached to quartz, and are associated with phenacite, orthoclase, muscovite and fluorite. They have a hardness of 6–7, a specific gravity of 2.598, and consist of:—

SiO_2	BeO	CaO	H_2O
51.8	39.6	1.0	8.4

Piedmontite. The optical properties of the manganese epidote piedmontite have recently been very carefully studied by Dr. Kotô,[5] of Japan, who finds it quite wide spread as a constituent of Japanese rocks. In a piedmontite-schist consisting of quartz, piedmontite, muscovite, garnet, rutile, feldspar, etc., the piedmontite is well crystallized with oP, $\infty P\overline{\infty}$, $\frac{1}{2} P\overline{\infty}$, P, and $P\overline{\infty}$ predominating. The mineral has an extinction of 3°, and is pleochrois as follows: vr = deep reddish violet; t = brownish red; pi = light violet. The absorption is vr > t > pi, whereas in common epidote it is t > pi > vr. An analysis yielded:—

SiO_2	Al_2O_3	Fe_2O_3	Mn_2O_3	CaO	MgO	K_2O	Na_2O	H_2O
36.16	22.52	9.33	6.43	22.05	.40	tr.	.44	3.20

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[1] Amer. Jour. Sci., Oct., 1888, p. 290.

[2] Cf. Amer. Naturalist, Feb., 1888, p. 169.

[3] Amer. Jour. Sci., 1888, Oct., p. 272.

[4] Ib., July, p. 52.

[5] Quart. Jour. Geol. Soc., Aug., 1887, p. 474.

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The same mineral is an accessory constituent of a glaucophane rock from Japan. It has recently been described, by Haworth,[1] as occurring in a porphyrite from Missouri, and is also mentioned by Lacroix[2] as existing in the mica-schists of the Island of Groix, off the coast of France.—*Emmonsite.* Near Brixlegg, in the Unterinnethal, is a mineral, occurring in little spherical groups of crystals implanted on barite. Its analysis gave 86.89 per cent. of $SrCO_3$, and 13.14 per cent. of $CaCO_3$, thus agreeing very closely with Thomson's *emmonsite* from Massachusetts. Cathrein[3] has measured the crystals, and found them to consist of rhombic prisms with $a : b : c = .6090 : 1 : .7236$.—*Diamonds and Sapphires.* A new discovery of diamonds and sapphires is reported[4] from Australia. The location where they have been found is Invere, New South Wales. They are found in a sand made up of quartz and tourmaline, and pieces of a rock composed of the same minerals.—*Leucite.* Prof. Judd[5] announces the discovery of leucite by Mr. T. W. E. David in a leucite-basalt from Byrock, N. S. Wales, Australia, about 450 miles N. W. from Sydney. Leucite, which until a few years ago was not known outside of Europe, is now known to occur in each one of the continents with the exception of Africa.—*Cryptolite*, the rare cerium phosphate, according to Mallard,[6] is nothing but *monazite* with a habit differing slightly from that which this mineral usually affects.—*Gadolinite* has been found, by Lacroix,[7] in a cavity in the granitite of the Mourne Mountains, Ireland, and *allanite* has been discovered, by Levy and Lacroix,[8] in a granite from Pont Paul, Finistère.

CRYSTALLOGRAPHIC NEWS.—In the course of an investigation of minerals from the Tyrol, Cathrein[9] detected in them several new planes. On a yellow-brown *garnet*, from Rothenkopf, $\frac{8}{3}O\frac{8}{5}$ was found. This form is especially interesting, because it is not only new to garnet, but also to the entire regular system. The new triakistetrahedron— $\frac{\frac{17}{9}O\frac{17}{9}}{2}$ occurs on *tetrahedrite* from Kogel, near Brixlegg; $\frac{39}{38}P\overline{\infty}$, $\infty P\overline{2}$ and $\frac{1}{7}P\breve{\infty}$ on *adularia* from Schwarzenstein; and $P\overline{\infty}$ on *diaspore* from Grenier.—In an elaborate paper on the crystallography of *dolomite* Becke[10] announces the dis

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[1] Amer. Naturalist, Aug., 1888, p. 732.
[2] Bull. d. l. Soc. Franç. d. Min., xi., p. 148.
[3] Zeits. d. Kryst., xiv., p. 366.
[4] Friedel: Bull. Soc. Franç. d. Min., xl., p. 64.
[5] Geol. Magazine, May, 1888, p. 193.
[6] Bull. Soc. Franç. d. Min., x., p. 236.
[7] Ib., xi., p. 68.
[8] Ib., xi., p. 65.
[9] Min. u. Petrog. Mitth., x., p. 52.
[10] Ib., x., p. 73.

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covery of the new forms $+\frac{r}{l}\frac{\infty R3}{2}, +\frac{r}{l}\frac{4R3}{2}, -\frac{e}{r}\frac{2R3}{2}, -\frac{l}{r}\frac{R\frac{13}{3}}{2}, -\frac{l}{r}\frac{8R3}{2}, +\frac{l}{r}\frac{4R3}{2}, +\frac{l}{r}\frac{\infty R3}{2}$. As indicated by these formulas, Becke finds dolomite to be rhombohedrally tetrahedral. In addition to the full lists of forms occurring on the mineral, there is in the paper a full discussion of its vicinal planes. —*Pyrite*[1] crystals from the clay slates near Trofajach in Steiermark, contain the new plane $\frac{\infty O6}{2}$. Michel[2] claims that crystals of the selenates of barium, strontium, calcium and lead are isomorphous with the natural sulphates of the corresponding metals.

MISCELLANEOUS.—Prof. Judd[3] has recently demonstrated in a very interesting paper that quartz may have secondarily developed in it a lamellar structure analogous to that which is so frequently produced in feldspar by pressure. The lamellæ in quartz are best brought out by etching. By studying the images reflected from the etched surfaces, Judd discovered that lamellæ existed only where the crystal examined had suffered injury; that the lamellæ were parallel to R and —R, which may be regarded as gliding planes; and finally that the change produced in the internal structure of the quartz consisted in a change in the nature of the circular polarization of the alternate lamellæ, and not in such a change as takes place in the development of twinning lamellæ in calcite and feldspar. It is thought that the planes along which a quartz crystal breaks when heated and suddenly cooled may be these gliding planes.—Prof. Crosby[4] discusses the origin of the silica that is often found cementing the grains in a sandstone, and suggests that it might result from the solution of siliceous organisms, which are everywhere abundant in the waters of the oceans, and may with some probability be assumed as occurring in the waters in which the sandstones were deposited.—Dr. E. A. Schneider[5] urges the importance of studying the effect of acids (especially hydrochloric) upon silicates, with the view of determining their constitution in a manner analogous to that so frequently made use of in organic chemistry for the purpose of determining the nature of the inner structure of carbonaceous substances.—Becke[6] proposes a method for distinguishing between quartz and feldspar in rock sections. It depends upon the fact that the former mineral is entirely dissolved by hydrofluoric acid, while the latter yields an amorphous aluminium fluosilicate, which can be stained with a solution of some aniline color.

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[1] Hoefer: Ib., x., p. 157.
[2] Bull. d. l. Soc. Franç. d. Min., xi., p. 182.
[3] Miner. Magazine, 1888, p. 1.
[4] Technology Quarterly, May, 1888, p. 397.
[5] Amer. Chem. Jour., x., p. 405.
[6] Min. u. Petrog. Mitth., x., p. 89.

MINERALOGY AND PETROGRAPHY.[1]

(From the AMERICAN NATURALIST, December, 1888.)

PETROGRAPHICAL NEWS.—Löwinson-Lessing[2] has suggested a scheme for the classification of ~~e~~lastic rocks. He would divide these into tuffs, breccias, conglomerates, pseudoschists and slaty rocks. Tuffs he would confine to rocks made up of crystals, or pieces of crystals, and separate minerals, and would subdivide into agglomerat~~es-t~~uffs (subaëreal) and tuffogenous sediments (submarine). The agglomeratic tuffs he would further separate according to structure. Tuff-like rocks produced from crystalline rocks by orodynamic forces, or by weathering, he would call tuffoids, and distinguish as elasto-tuffs and decomposition-tuffs (Verwitterungs tuffen). The breccias are composed of pieces of rocks cemented by rock material. They are divided into primary, or volcanic, and secondary, or metasomatic breccias. The volcanic breccias include the lava agglomerates (Reibung's-breccias), composed of pieces of foreign rock, or of the crust of a lava stream, which have been cemented together by a molten rock, and tuff-lavas (Spaltung's-breccia), those produced by the separating from a molten magma of certain portions, and their consolidation into a rock mass by the cooling of the remaining portion. Both of these classes are again subdivided according to structure. The conglomerates include the conglomerates proper, psammite (a micro-conglomerate) and sandstone (when the microscopical grains are those of single minerals). The pseudoschists are metamorphosed sediments, breccias, or tuffs in which the line between the fragments and the cement has partially disappeared. The slates have the same signification as at present. —The basalt forming two hills near the village of Grossdehsaer, west of Löbau, in Saxony, contains numerous inclusions of granite which possess features of great interest. The basalt is composed of a mesh of augite crystals and a little glass, in which porphyritic augites, olivine, magnetite and a little plagioclase are imbedded. It contains also little veins of a colorless substance, with the chemical properties of nepheline. The basalt in breaking through the underlying granite brought pieces of the rock with it to the surface. The changes which have been produced in these included fragments and the effect which they in turn have produced in the basalt, are the occasion of a recent paper by Beyer.[1] The inclusions are divided into the porphyritic and glassy varieties. The basalt first disintegrated the granite, and then separated the broken fragments into their constituent minerals. These were then partially dissolved —the mica disappeared entirely and magnetite and spinel were developed; in the vicinity of feldspar new feldspathic material crystallized; the quartz was corroded and around its edges a light colored augite was formed. In the porphyritic inclusions remains of quartz and feldspar are still to be found; in the glassy ones all traces of the original minerals have disappeared, the composition of the glass alone remaining as proof of the granitic character of the inclusion. The effect of the inclusions upon the basalt is seen in the disappearance of the olivine, and the development in its stead of a brown glass surrounded by augite crystals. In the more acid portions feldspar has separated and has included many microlites of augite within itself. While these changes were going on in the granite and basalt, steam escaped from the mass of rock and produced a slaggy condition in the glass inclusions, and new minerals which are implanted in the walls of the cavities. In one case little colorless hexagonal crystals have the composition:—

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[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Me.

[2] Miner. u. Petrog. Mitth., ix., p. 528.

SiO_2	Al_2O_3	CaO	MgO	K_2O	Na_2O	H_2O
57.50	18.11	4.63	1.20	6.98	2.40	10.48.

—The islands off the coast of Morbihan, France, contain strata of schistose pyroxene rocks, interbedded with archæan gneisses and mica-schists. They consist of sphene, garnet, green pyroxene, plagioclase, quartz, mica and pale hornblende in large crystals. Vesuvianite and zircon also occur in them in small quantity. The pyroxene, comprising the larger part of the rock, is of a light green color, and possesses the diallagic parting. The plagioclase—labradorite and anorrhite—is present in large quantity in some varieties of the rock, and always shows a tendency to alter into wollastonite. The hornblende and quartz are both secondary. These pyroxenites resemble very closely the flaser-gabbros of the Germans, but are supposed by Barrois[1] to be metamorposed limestones. He describes a limestone in contact with granite in the same region, in which the minerals characteristic of the pyroxenites have been developed.—Chrustschoff[2] includes under the name perthitophyre a series of dyke rocks occurring in the Department Volhynia, Russia, whose characteristics differ from those of any rocks heretofore described. They consist of an interstitial micropesthitic substance, in which various amounts of idiomorphic quartz, labradorite, monoclinic and orthorhombic augite, olivine, and other minerals are imbedded. In the coarser varieties the iron-bearing minerals are not abundant, while in the finer grained kinds they are in as large quantity as the feldspar. In the course of his article the author describes parallel growths of diallage and acicular crystals of an orthorhombic pyroxene, and also an apparently triclinic pyroxene. He also mentions the existence of anatase as an inclusion in the feldspar and quartz, and gives in brief the properties of a mineral whose nature he is unable to determine — Sandberger[3] describes inclusions of hypersthenite, olivine-gabbro, and a rock composed of olivine, arfvedsonite, picotite, eustatite, sanidine and augite, from the phenolite of Heldburg, in the Thüringer Wald.—Posepny[5] gives brief descriptions of a few sections of adniole in the course of an article discussing the structure of the well-known mining region in the vicinity of Przibram, Bohemia.

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[1] Miner. u. Petrog. Mitth., x., p. 1.

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American Minerals.—A series of analyses[4] of *beryl* from Norway, Maine and Willemantic and Litchfield counties, Ct., seems to show that beryllium and the alkalies mutually replace each other in this mineral, and that water is a constant constituent. An analysis of *phenacite* from Florissant, Col., gave practically no alkalies. The barium feldspar (*cassinite*) from Bene Hill, Delaware county, Pa., first analyzed by Genth,[5] has been re-examined by

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[1] Barrois: Ann. d. l. Soc. Geol. du Nord., xv., p. 69.
[2] Miner. und Petrog. Mitth., ix., p. 470.
[3] Neues Jahrb. f. Min., etc., 1888, ii., p. 24.
[4] Miner u. Petrog. Mitth., x., p. 175.
[5] Report Min. Penn., 1866, p. 224.

Penfield and Sperry,[1] and found to have the composition :—

SiO_2	Al_2O_3	Fe_2O_3	CaO	Na_2O	BaO	K_2O	Ign.
62.95	19.82	.17	.25	4.01	3.95	8.57	.11

a result agreeing very closely with that of Genth. The authors regard the substance as a mixture of 35.23 per cent. albite, 51.15 of orthoclase, and 13.17 of hyalophane. The microscopical examination of its thin sections reveals the presence of albite lamellæ intergrown with orthoclase, but does not show the hyalophane. analyses of *monazite* from Alexander county, N. C., of sussexite from Franklin, N. J., and of a very pure phlogopite from Edwards, St. Lawrence county, N. Y., are given in the same article.—Wülping[2] has used the results obtained by Riggs[3] in his careful analyses of tourmaline, to determine a general formula for the composition of this complex mineral. By reducing the amounts of the various substances found by Riggs to their equivalents in SiO_2, B_2O_3, Al_2O_3, MgO, Na_2O and H_2O, Wülping[5] concludes that the mineral may be represented as a compound of the molecules 12 SiO_2, 3 B_2O_3, 8 Al_2O_3, 2 Na_2O, 4 H_2O, and 12 SiO_2, 3 B_2O_3, 5 Al_2O_3, 12 MgO, 3 H_2O, in various proportions.—Crystals of *phenacite* from Mt. Antero, Col., present two habits. Those found in quartz or beryl consist essentially of rhombohedra of the third order, combined with prisms of the second order, while those attached to orthoclase show in addition a prism of the first order. The rhombohedral faces are dull, and the prismatic faces are vertically striated. Twin crystals of quartz with P_2 as the twinning plane are also described. —A remarkable variety of *oligoclase* from near Bakersville, N. C., is described by Kunz[6] as perfectly transparent. It has a faint green tinge, and contains cavities surrounded by tufts of white acicular microlites, like the glass that often solidifies in the bottoms of glass pots. It has the usual perfect cleavage of oligoclase, but is not striated. According to Messrs. Penfield and Sperry,[7] the optical properties of the mineral are abnormal. Sections parallel to oP show a positive extinction of 39°–40°. Those parallel to $_\infty P'_\infty$ remain dark during an entire revolution between crossed nicols, but in converged light yield an optical axis in the centre of the field instead of a bisectrix. The same writer calls attention to *quartz* pseudomorphs after spodumene from Peru, Me.; pseudomorphs of *iron oxides* after aragonite from Puma Co., Ariz., and beautiful transparent *cyanite* from Bakersville, N. C.—Crosby and Greeley

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[1] Amer. Jour. Sci., xxxvi., p. 317.
[2] Miner. u. Petrog. Mitth., x., p. 161.
[3] Amer. Naturalist, 1888, p. 250.
[4] Amer. Jour. Sci., xxxvi., p. 321.
[5] Ib., p. 222.
[6] Amer. Jour. Sci., xxxvi., p. 324.
[7] Technology Quarterly, May, 1888, p. 407.

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have discovered that the brown massive mineral from Newbury, Mass., and regarded by Dana as garnet, is vesuvianite. It has a specific gravity of 3.55 and a composition :—

SiO_2	Al_2O_3	FeO	CaO	MgO	K_2O	Na_2O	MuO_2	P_2O_5
35.93	14.77	8.91	39.46	.13	.44	.36	tr.	tr.

—A hard black mineral occurring at Rome, Mass., in little octahedra, has been examined by Crosby and Brown,[1] with sufficient accuracy to lead them to declare it gahnite.

MINERAL SYNTHESES.—Doelter[2] has effected the synthesis of a large number of *micas* by fusing together aluminium-bearing silicates and metallic fluorides. The hornblendes yielded biotite when fused with sodium and magnesium fluorides. The alumina-free hornblendes gave olivine or augite. Garnets yielded meroxane. Micas of different kinds were obtained by fusing K, Al, SiO_4 with sodium fluoride alone; or with this salt and potassium fluosilicate or magnesium silicate, with or without the addition of ferrous silicate. All the micas thus produced were decomposed when the temperature of the mass was raised to a white heat, and olivine, augite or scapolite were formed. Muscovite was obtained from andalusite by fusing it with potassium fluosilicate and aluminium fluoride, and zinnwaldite, when a little lithium carbonate was added to the mixture. Many other points of interest are found in the paper, which will undoubtedly prove of value in discussing the paragenesis of minerals in rock masses.—Among the other minerals produced artificially within the past few months, attention may be called to *rhodonite* and *tephronite*, which Gorgeu[3] obtained by heating to a high temperature, in the presence of water vapor, a mixture of manganese chloride and precipitated silica. Wollastonite[4] was produced when calcium chloride was used instead of the manganese compound. *Barite*, *celestite* and *anhydrite* were obtained[5] by fusing the corresponding amorphous compounds in the chloride of some metal.—Bourgeois[6] fused metallic tin with copper oxide and got crystals of *cassiterite*.—Dufet[7] prepared *pharmacolite* by allowing solutions of calcium[8] nitrate and di-sodium arsenate to diffuse slowly into each other.

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MISCELLANEOUS.—Julien believes that the rate of decomposition in pyrite depends upon the amount of marcasite present in it

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[1] Ib., p. 408.

[2] Min. und Petrog. Mitth., x., p. 67, and Neues Jahrb. f. Min., etc., 1888. ii., p. 178.

[3] Bull. Soc. Franç. d. Min., x., p. 264.

[4] Ib., x., p. 271.

[5] Ib., xi., p. 58.

[6] Ib., x., p. 284.

[7] Ib., xi., p 187

[8] Ann. N. Y. Acad. of Sci., iv., July, 1888.

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Easily decomposable pyrite is not pure, but is intimately mixed with marcasite, probably in the most minute, *i.e.*, molecular condition. The more rapid alteration of marcasite is supposed to be due to the open structure of the mineral in consequence of the interlacing of twinned crystals, etc.—Mr. Dunnington[1] thinks that the origin of the massive oxides of manganese may be explained by reference to the well-known dissolving effect of sulphate solutions upon manganese compounds. The sulphates may easily have been derived by the decomposition of pyrites. This theory would account for the great depth at which certain deposits of manganese ores are found, and their concentration in masses.—In an article extending through several numbers of *Nature*, Lockyer[2] gives an interesting résumé of the state of our knowledge in regard to meteorites—their structure, composition and origin.—Rauff[3] announces the invention of a newrock slicing machine, and an instrument for cutting crystals parallel or perpendicular to any given natural face.

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[1] Amer. Jour. Sci., Sept., 1888, p. 175.
[2] Ib., Sept., 1888.
[3] Neues Jahrb. f. Min., etc., 1888, ii., p. 230.

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